American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

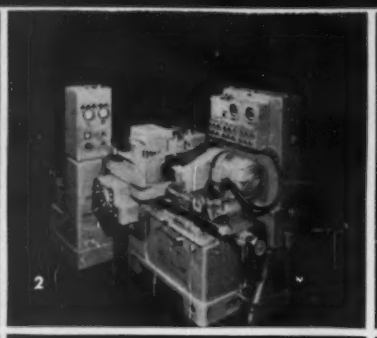
SEPTEMBER 12, 1955

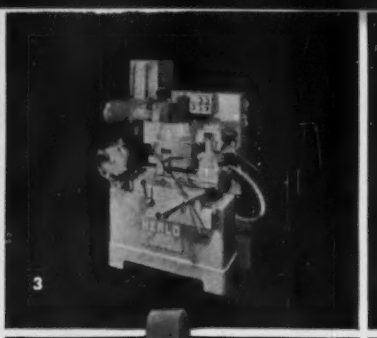
FLOOD rips New England Metalworking . . . our own on-the-spot picture story, page 170

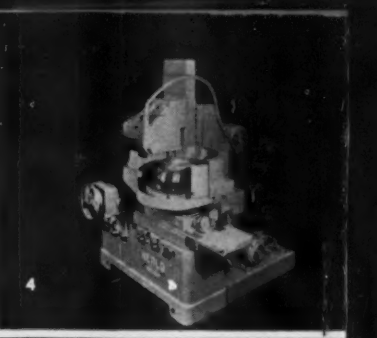
Deep drawing radar-tube weld rings — see page 2

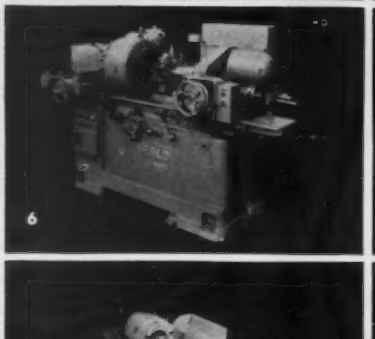
Copying Lathes Cut Costs — A SPECIAL REPORT

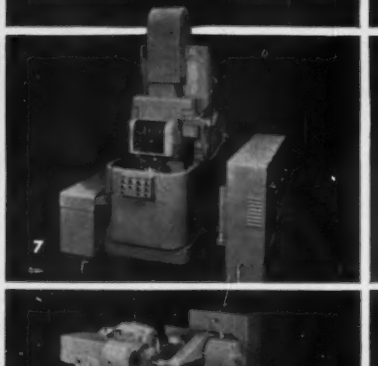
How to Set Accurate Taper in a Lathe

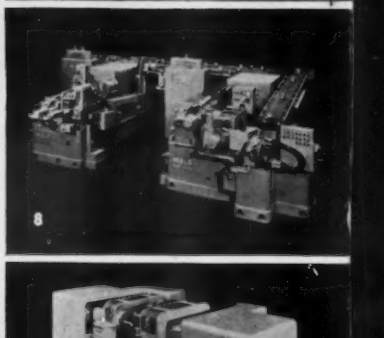


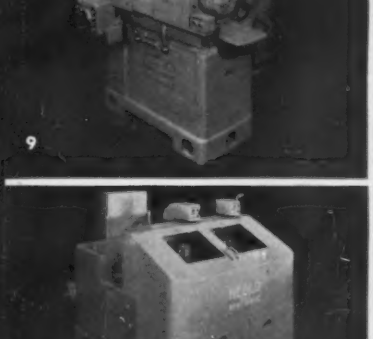


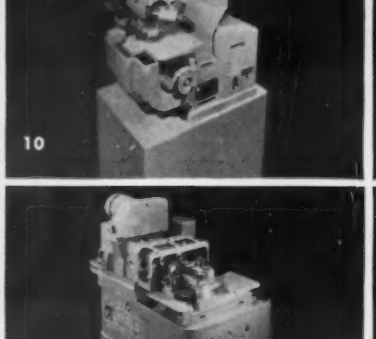


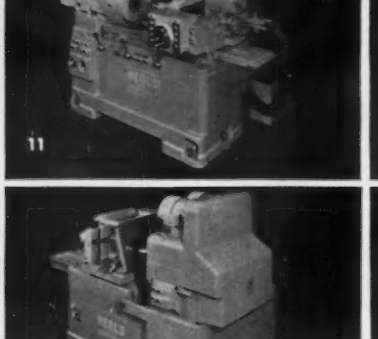


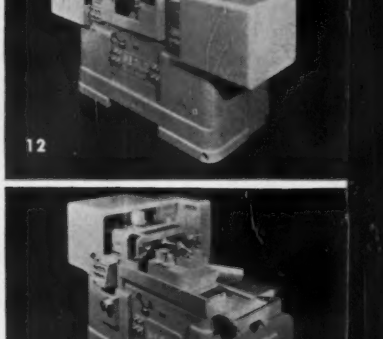












NOW SHOWING

in Booth 902 at the Machine Tool Show

16 reasons why it PAYS to come to HEALD

1 **Model 190 Centri-Matic** Fully automated setup with rotary diamond, self-adjusting cycle and feedback.

2 **Model 1901 Centri-Matic** High production cycle with skip compensation and dressing, automatic after-gaging and feedback.

3 **Model 161 Rotary** Completely new, mechanically operated column-type unit for small work.

4 **Model 361 Rotary** Completely new vertical-column type unit for large work.

5 **Model 170 Size-Matic** Hopper-fed, auto-chucking unit with after-gaging and feedback.

6 **Model 271 Tool Room** High-precision internal with half-wave rectification for infinitely variable workhead speed.

7 **Vertical Bore-Matic** Completely new machine with vertical base for slide unit.

8 **Automated Borizing Unit** New, fully automated setup with automatic conveying, orienting, clamping, borizing, unclamping, flushing and after-gaging.

9 **Model 171 Size-Matic** Simultaneous bore and face grinding with slide-bar facing unit.

10 **Model 3 Tool Sharpener** New design with improved operation and longer life.

11 **Model 271 Gage-Matic** No. 2 size internal grinder with sliding-jaw collet chuck.

12 **Model 222 Bore-Matic** Double-end unit with multiple tooling for straddle facing, flycutting, spherical and taper boring.

13 **Model 242 Bore-Matic** Vertical spindle mechanical cam-slide unit.

14 **Model 2 Cam-operated Bore-Matic** Completely new machine set up for borizing all surfaces of work.

15 **Model 3 Cam-operated Bore-Matic** Completely new cam-type machine, set up to demonstrate Heald Feed-Out Quill.

16 **Model 321 Bore-Matic** Demonstrates versatility of interchangeable tooling and use of damped quills.

These new Heald developments represent the latest advances in precision finishing methods and equipment. They offer new opportunities for increased production, improved product quality and lower manufacturing cost per part.

All of these units are on display at the Heald exhibit — all in actual operation on production parts. Here you can see the tremendous progress that has been made in the productive efficiency of Heald borizing, internal grinding and rotary surface grinding equipment. You'll see why *now*, more than ever before, IT *PAYS* TO COME TO HEALD.

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American Machinist

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CONTENTS FOR SEPTEMBER 12, 1955

Vol 99, No 19

ADMINISTRATION

119 EDITORIAL *Burnham Finney*
124 HOW TO MAKE WORK HABIT-FORMING *G S Odiorne*
153 AND . . . THEY'RE OFF!! *Round Table*

SPECIAL REPORT

137 HOW COPYING LATHES CUT COSTS *George H De Groat*
170 FLOOD IN NEW ENGLAND

MATERIAL CUTTING, FORMING

121 SETTING ACCURATE TAPER
128 SHOP SHOTS
156 SPRING AND PLUG SET DIAMOND DRESSER *R L Levy*
156 PRISM SPEEDS ROUGH LAYOUT *Clifford Molloy*
157 ABRASIVE MAKES HOLES IN GLASS *Phil McCafferty*
160 SINGLE-POINT TOOL BROACHES KEYWAY *Frank Biechele*

TOOLING

158 TWO-STAGE BENDING TOOL *H H Fronicke*
158 LEATHER ABSORBS VIBRATIONS *J A Raczkiewiez*
159 TWO-TOOLBIT HOLDER EASES CUTTING THREADS *C R Saville*
159 EXPANDING MANDREL HOLDS CUP *Hjalmar Dahl*
160 DRILLS FOR PLASTICS *F Strasser*
163 CHECK LIST FOR JIG AND FIXTURE DESIGN *Reference Book Sheets*

ENGINEERING

149 DESIGN FOR WELDING *Gordon Cape*

INSPECTION

134 ULTRASONIC INSPECTION SPEEDS DRIVE-TUBING OUTPUT *Leo Adams*
157 DROPPER AIDS DYE APPLICATION *Frank Buczkowski*
159 INDICATOR ON DIVIDERS GAGES WORK *A K Milton*
160 COMPOUND CHECKS DIE CAVITIES *F H Dingenfelder*

ASSEMBLY

126 CHROMIUM CARBIDE SILVER-BRAZED *C R Benson, E S Chamer*
150 ONE SETUP BLADES AND BALANCES WIND-TUNNEL ROTORS *H J Baker*
154 WELDING LOW-ALLOY STEEL TO STAINLESS *Karl Dorschu*

FINISHING

130 9 MEN PLATE 5000 BUMPERS A DAY *George H De Groat*

NEWS OF METALWORKING

105 SPOT NEWS
107 WASHINGTON
109 DETROIT
111 MACHINE TOOLS
115 GAGING METALWORKING
170 NEWS OF METALWORKING
178, 246 NAMES IN THE NEWS

DEPARTMENTS

98 BACKLASH
156 PRACTICAL IDEAS
163 REFERENCE BOOK SHEETS
169 TALKING SHOP
180 EQUIPMENT, MATERIALS, PARTS

NUMBER OF COPIES PRINTED THIS ISSUE 37,991

chips

DEEP-DRAWN RADAR PARTS . . . Weld rings for radar tubes are deep-drawn at 48 per min on the 10-station Waterbury-Farrel eyelet machine on our cover. Only 8 stations are used to draw the part from 0.015-in. Kovar, a glass-to-metal-seal alloy, at Volkert Stampings, Inc, Queens Village, NY. The 2¼-in. strip is drawn in three steps, their sizes and concentricity, plus the necessity of holding corner radii to a strict minimum, making it a difficult operation.

COPYING LATHES . . . Our ubiquitous Detroit editor, George De Groat, has put together a number of new examples of copying-lathe applications, to indicate the breadth and popularity of this technique. They form our current 12-page Special Report, include comparisons of templets and parts, and a number of photographs.

PLATING . . . At Oldsmobile, a new mechanized setup makes it possible for 9 men to plate 5000 bumpers a day. We tell all in a 4-page story. There are a mile of conveyors, 300 limit switches, and a multi-million-dollar setup handling 125 tons of steel a day.

ULTRASONIC INSPECTION . . . To keep you informed of the latest in ultrasonics, Leo Adams, metallurgist at Plant 1 of Saginaw Steering-Gear Div, GMC, describes inspection of drive tubing from a high-speed continuous resistance-weld tube mill. Ultrasonics replace a hydrostatic setup, do a better job faster.

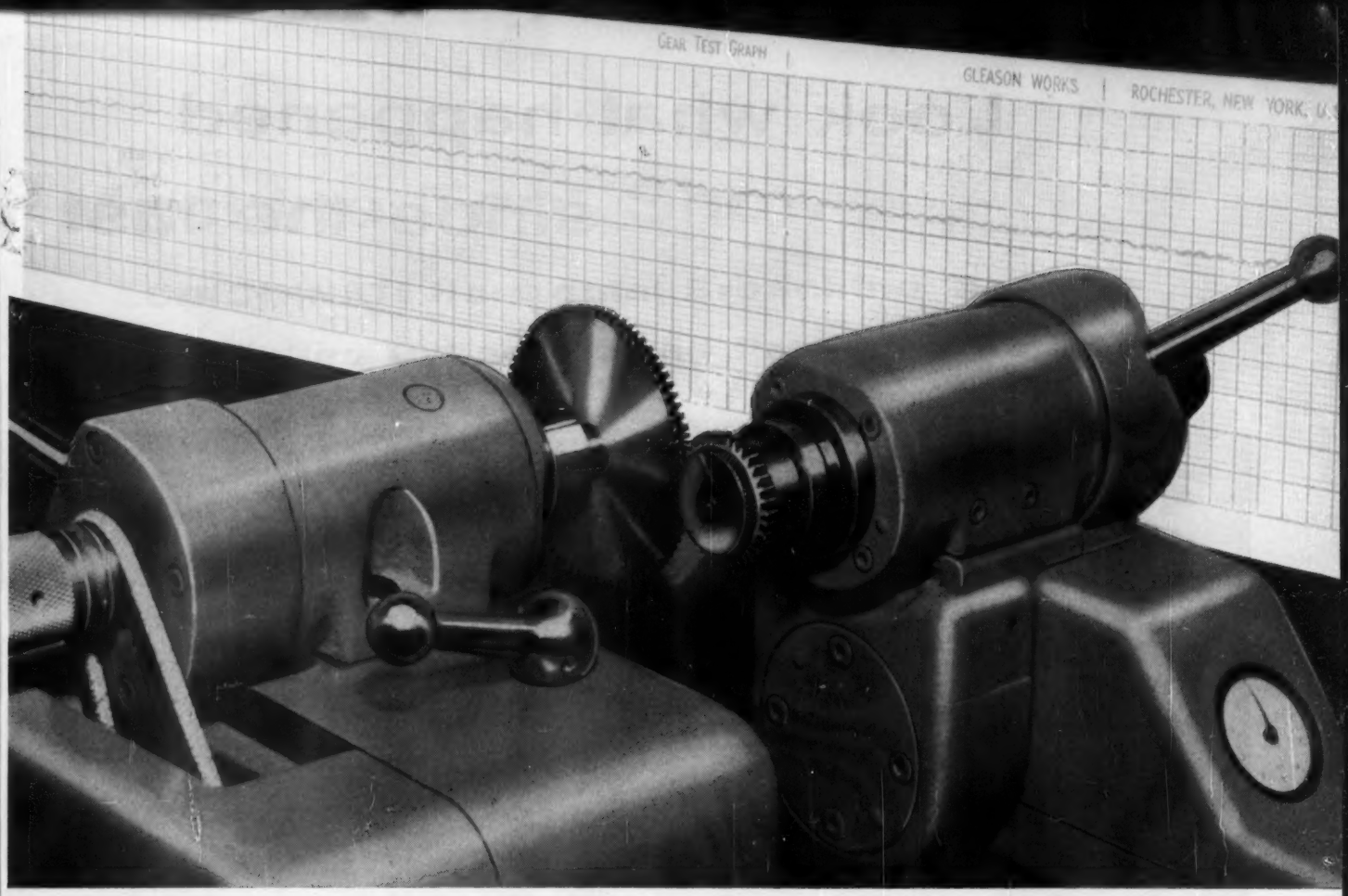
WELDING . . . Two articles in the current issue discuss welding. In one, Karl Dorschu of the Aviation Gas Turbine Div, Westinghouse shows how to spot or seam weld SAE 4130 to SAE 51410 — a low-alloy to stainless — thus conserving scarce materials . . . Gordon Cope of Dominion Bridge contributes a page on design for welding, showing how to change a design from casting to weldment. It's an old idea, but bears reiteration.

ROTORS . . . H J Baker, mfg engineer of Westinghouse at Sunnyvale, Calif, shows how blades were inserted in a 30-ft-dia compressor rotor weighing over 20 tons, and how the rotor was balanced. It took a special machine to do the job . . . We also have a spread of Shop Shots showing two welding tricks, a deep-hole drill with high-pressure coolant, a coil winder and a 1-man stamping line.

SILVER BRAZING . . . Chromium carbide resists corrosion, high temperature and wear but forms an oxide at brazing temperature. C R Benson of Carboloy describes a new flux containing boron which with a suitable brazing alloy makes a strong joint on chromium carbide by conventional torch brazing.

COMING . . . Sept 26 *AM* will be our Chicago Show Report issue, with a lengthy roundup of the three Shows. There'll be a Special Report on Ansco Camera, stories on mist cooling, an auto-collimator, a self-resetting lathe, painting, and an unusual cover.

GEOMETER . . . The broad field of geometric instruments is one interest of Lew Suverkrop, consulting engineer who wrote our lead article on lathe taper complete with punctuated zeros. He is an authority on design, construction, and manufacture of survey instruments, and a specialist in the problem of commercial ultra-precise circle-dividing where the limit of error is less than ½ arc-second. His work in these and other fields has involved considerable travel abroad. He has BSc and EM degrees from Michigan Tech, class of '17, is registered in Calif as mechanical engineer, petroleum engineer, and surveyor. In WWI he helped develop sound-ranging instruments, and used them at the Front. Besides consulting, he operates a development and pilot-manufacturing shop. His versatility and interest in mechanical precision are inherited from his father, E A Suverkrop, associate editor of *AM*, 1904-1919, who independently made, then obtained the first patents on making, Swedish gage blocks. His hobbies are watercolors and design of type faces.



Make a complete test and record of your small spur and helical gears

You can be certain that your spur and helical gears will operate correctly in their final mountings if you give them a complete test *before* actual assembly.

The new Gleason No. 104 Spur Gear Tester gives you a complete check of your gears. A rolling test for composite error provides a quantitative check of tooth spacing, profile shape and runout.

In this test, the gears are slowly rotated while a calibrated spring load keeps them in metal-to-metal contact. Any error in the gears results in a horizontal movement of the drive spindle. A completely electronic pickup and recorder make a *permanent* chart of the results.

But there is still another test you can make with the No. 104 Tester—a running test, which simulates actual operating conditions, determines the smoothness of operation, noise characteristics, and tooth contact, which will actually be obtained when the gears are used.

This machine tests precision and commercial gears up to 4½" center distance.

We will gladly furnish further information on the No. 104 Spur Gear Tester. Write for our bulletins.

The No. 104 Tester is furnished complete with an electronic pickup and recorder unit, as shown above.

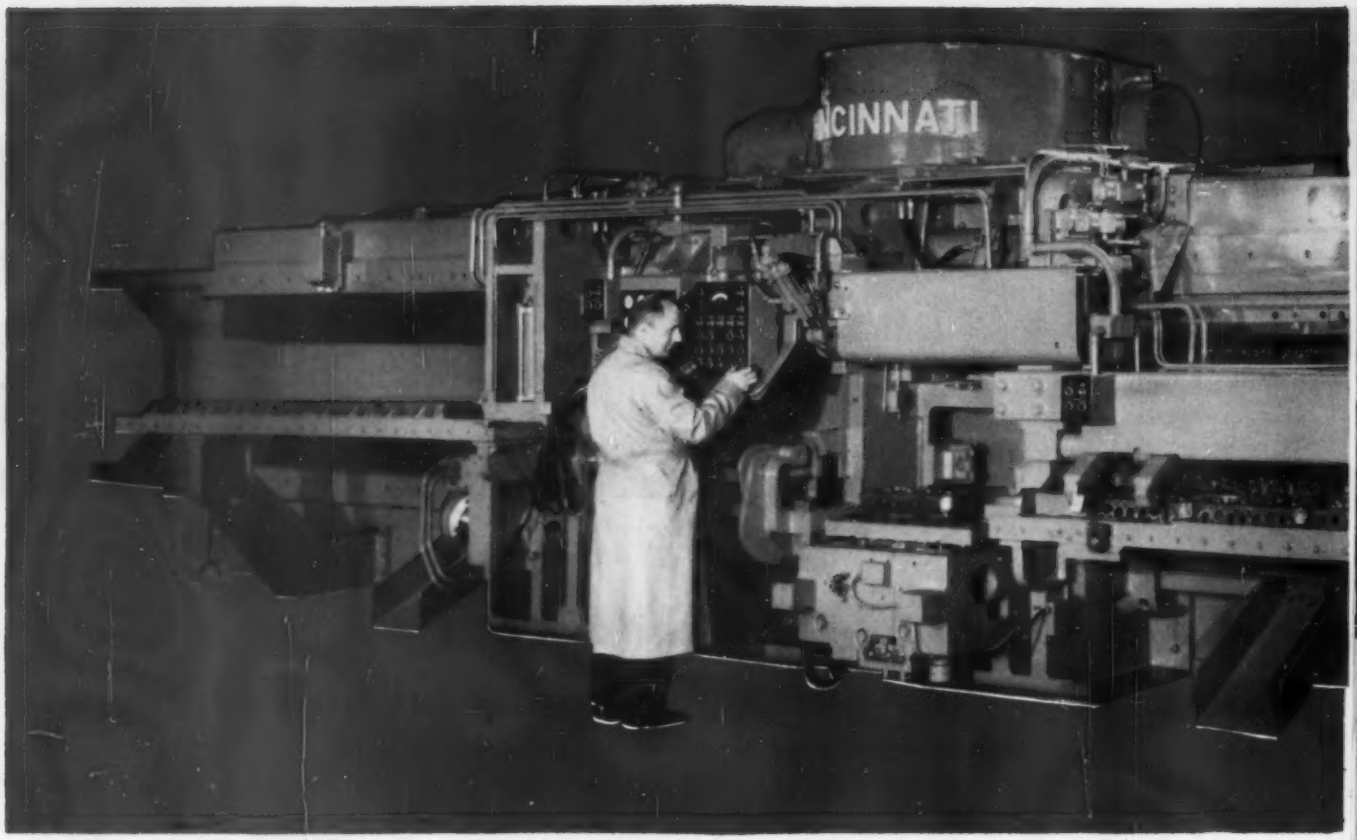
GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

61

Look what happened since the last



CINCINNATI 22-foot stroke, Two-Way Horizontal Broaching Machine, tooled up and conveyorized to broach cylinder heads.

PRODUCTION DATA

Surfaces broached	*top, joint, intake and exhaust faces*
Cutting speed	*150 feet per minute*
Stock removal	*3/16" (1/2 ton per hour)*
Production	*150 heads per hour*

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING

Machine Tool Show

CINCINNATI Horizontal Broaching Machine Multiplies Cylinder Head Production by 2 1/2

A few years ago, about the time of the last machine tool show, cylinder blocks and heads were machined at a comparatively slow rate of production. Large horizontal broaching machines were then operating at a speed of about 37 feet per minute, producing 60 parts per hour.

Today CINCINNATI Horizontal High Speed Surface Broaching Machines are operating at speeds up to 200 feet per minute, producing 150 parts per hour, and tool life per unit has increased 25 times.

While these cost savings are more spectacular than might be realized in the production of smaller parts, they are indicative of the big strides made by Cincinnati Milling in reducing costs through the application of modern broaching techniques. Remember this: Cincinnati's broaching experience dates back more than 20 years . . . Cincinnati was first in developing many present-day broaching concepts such as electro-mechanical drive . . . Cincinnati builds a complete line of horizontal and vertical broaching machines, including large special broaches built to your specifications. Would you like to have a picture-book review and brief specifications of CINCINNATI Horizontal Broaching Machines? Write for catalog No. M-1910.

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CINCINNATI 9, OHIO

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HERE'S versatility that pays dividends. For the Fellows 36-Type Gear Shaper has real "earning power"... whether used to handle virtually every job that comes up in a small gear department... or concentrated upon the heavy work in a large production shop.

A powerful, ruggedly constructed, heavy duty machine, the 36-Type can take extra heavy cuts at high speed... yet hold close limits. Low set-up time, fast gear-shift change from heavy to fine feed, quick dial adjustment from one cutter-spindle speed to another... these are just a few of the ways the 36-Type keeps down costs.

Ask your Fellows Representative to explain *all* the profit-making advantages built into the 36-Type... as well as the Fellows Plan for deferred payment. Write, wire or phone any Fellows Office!

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No. 418 Cylindrical Grinder

Gives You Accuracy, Speed and Economy in Precision Plunge or Traverse Grinding of Small Parts...

Don't wait . . . for extra profits install a Van Norman Machine now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company. ***Lease and Conditional Sales Contracts not available to Export.***

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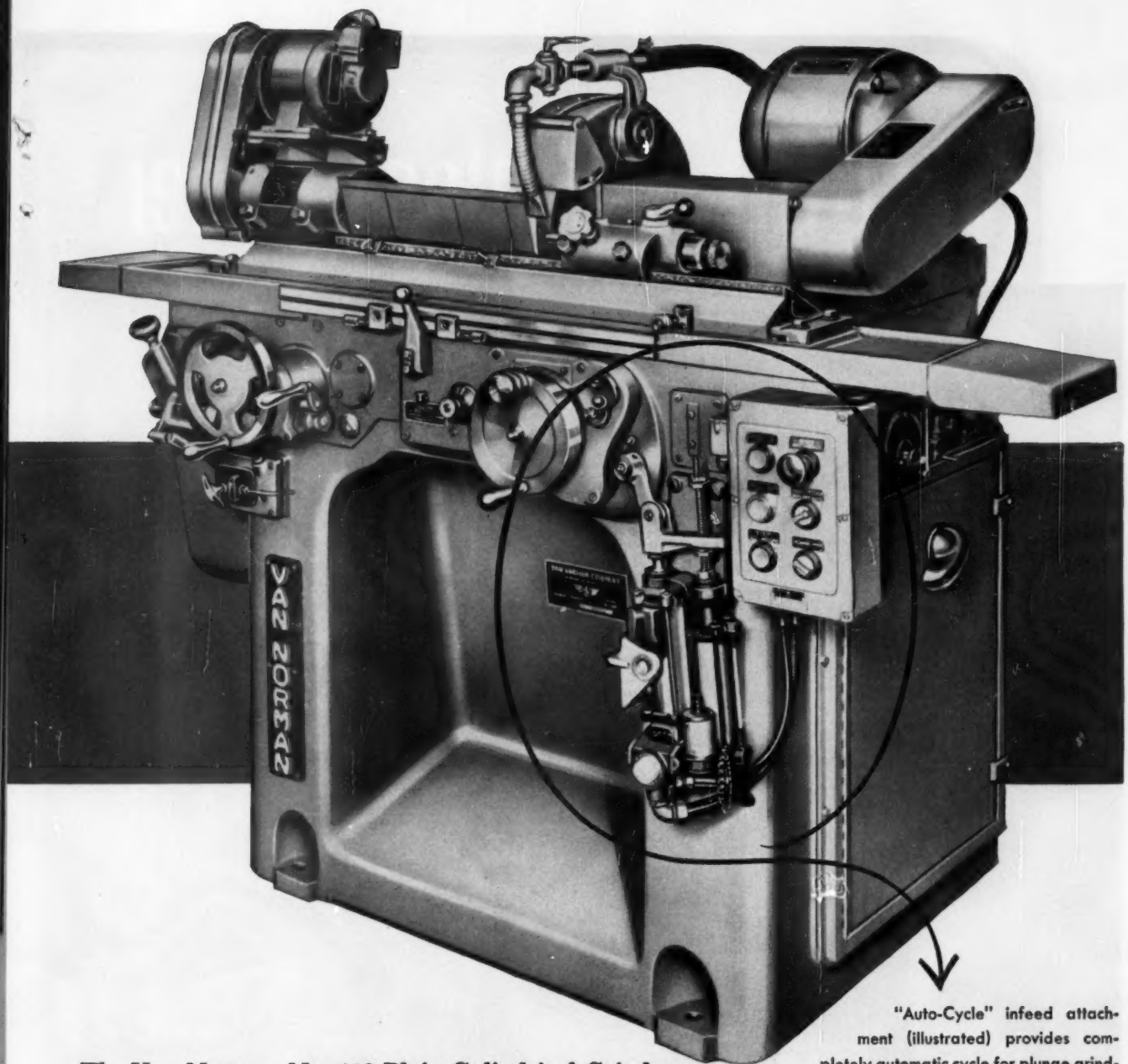
MANUFACTURERS of—Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

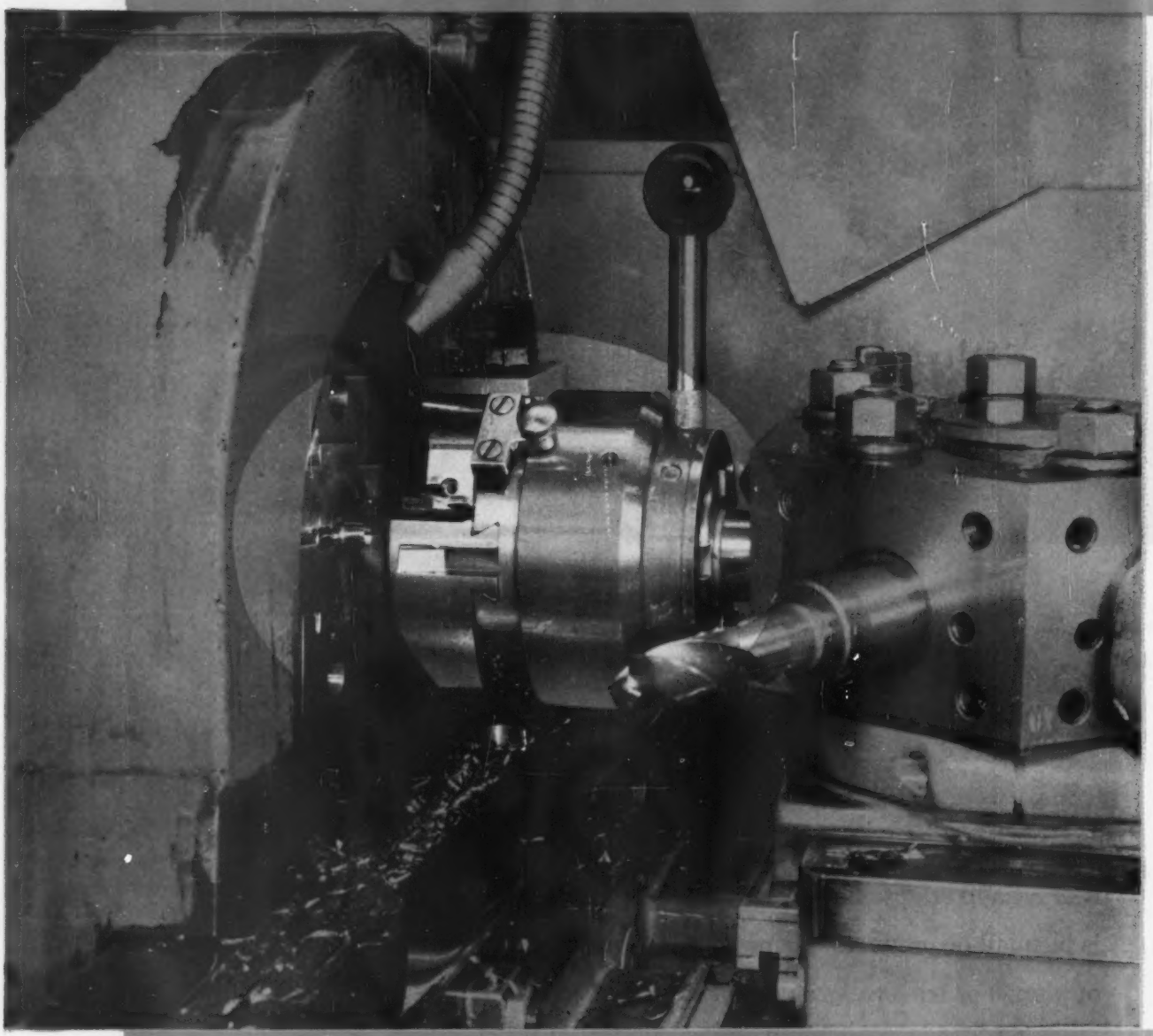


"Auto-Cycle" infeed attachment (illustrated) provides completely automatic cycle for plunge grinding at low additional cost (optional). Work size 4" Diam. x 18" Long. Grinding Wheel 14" O.D. x 2" Wide. 2 H.P. Wheel Motor — — 3 H.P. Optional.

The Van Norman No. 418 Plain Cylindrical Grinder is especially adaptable for use in plants where work is in small or production runs where it will cut costs of plunge or traverse grinding of small parts. Set-ups are quick and easy . . . workpieces are easily loaded, ground and unloaded with minimum motion and effort. Call, wire or write for Bulletin giving complete details.

COMPANY | **SPRINGFIELD 7, MASSACHUSETTS**

1800 Stainless Steel



LANDIS *Machine* COMPANY

WAYNESBORO · PENNSYLVANIA · U. S. A.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

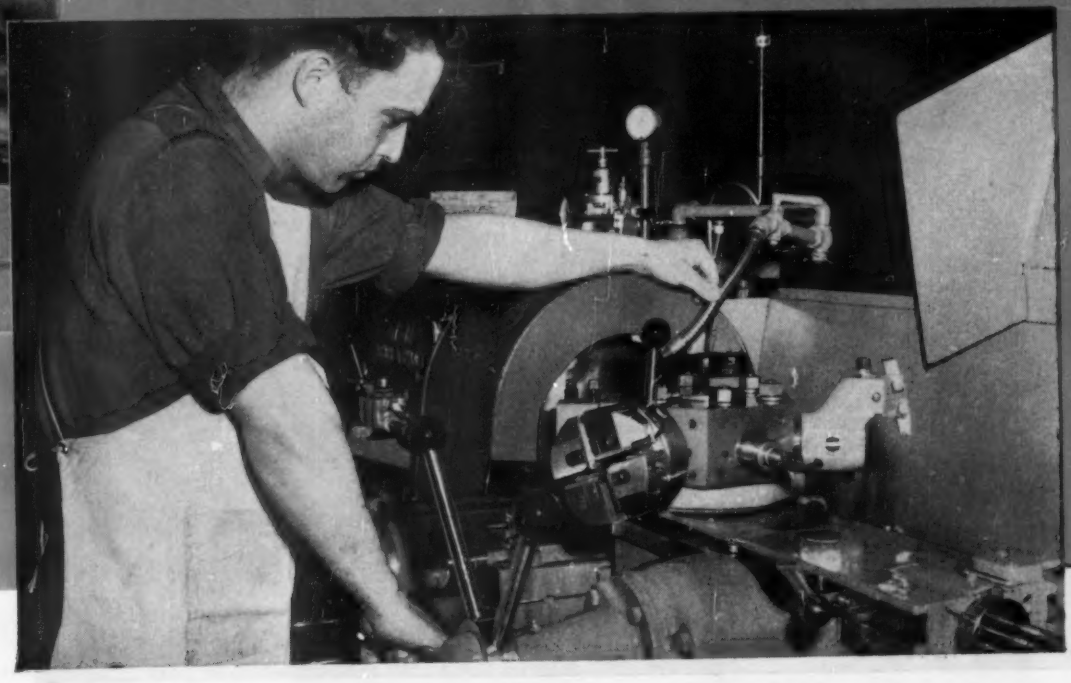
Threads Per Chaser Grind

LANDMATIC HEADS are every day saving production dollars for the Crawford Fittings Company of Cleveland by low tool cost and minimum machine downtime.

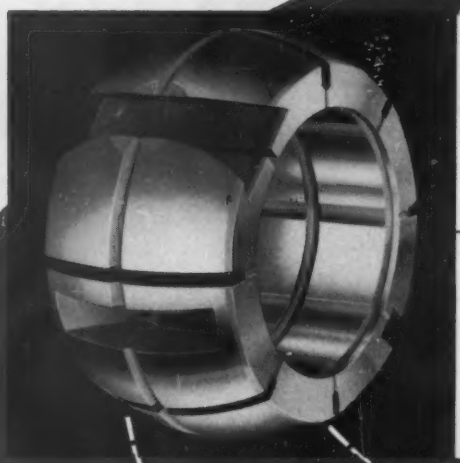
This company manufactures Swagelok Tube Fittings ranging from ⅛" to 1" in diameter. These fittings are produced from stainless steel tees of austenitic type 316 cold-worked to a Brinell hardness of 250. In producing the 7/16" fitting, for example, (as illustrated) 20-pitch straight UN threads are cut close to the shoulder 5/16" long to Class 3 fit.

LANDMATIC Hardened and Ground Heads, such as used by Crawford, are designed to produce threads to Class 3 or 4 fit in all types of tough materials. Unusually heavy construction and sound fundamental die head design assure the rigidity necessary for accurate threads. The inherent features of the design of the Landis Tangential Chasers and their proper manufacture and hardening, developed during 50 years of threading experience, ensure long chaser life and low threading cost.

If you require threads on stainless steel or other tough material, LANDMATIC Hardened and Ground Heads offer you these same cost-saving features. Please send specifications and write for Bulletin F-80 for additional information.



Multi-wheel spindle



Rigidized Microsphere Bearings

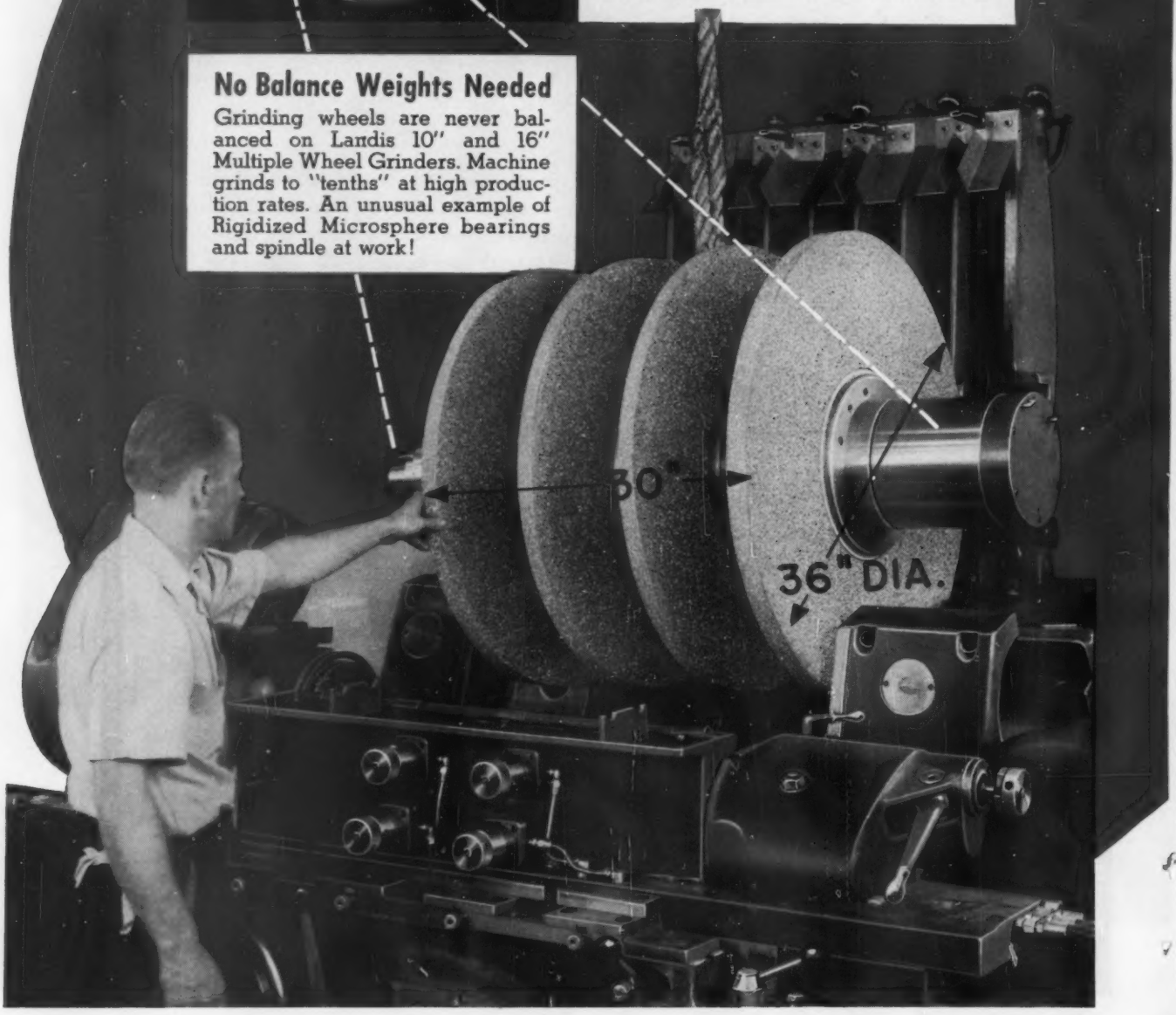
These one piece steel bearings are babbitt lined. The spherical shape permits perfect alignment of the spindle and bearing. Extremely close running clearance results in quick sparkout and accurate response to wheel feed.

Rigidized Wheel Spindle

Spindle diameter is increased between the Microsphere bearings on Landis grinders. This extra stiff spindle, coupled with the Microsphere bearings is the most rigid wheel unit available. Pays off in steady production and accurate work.

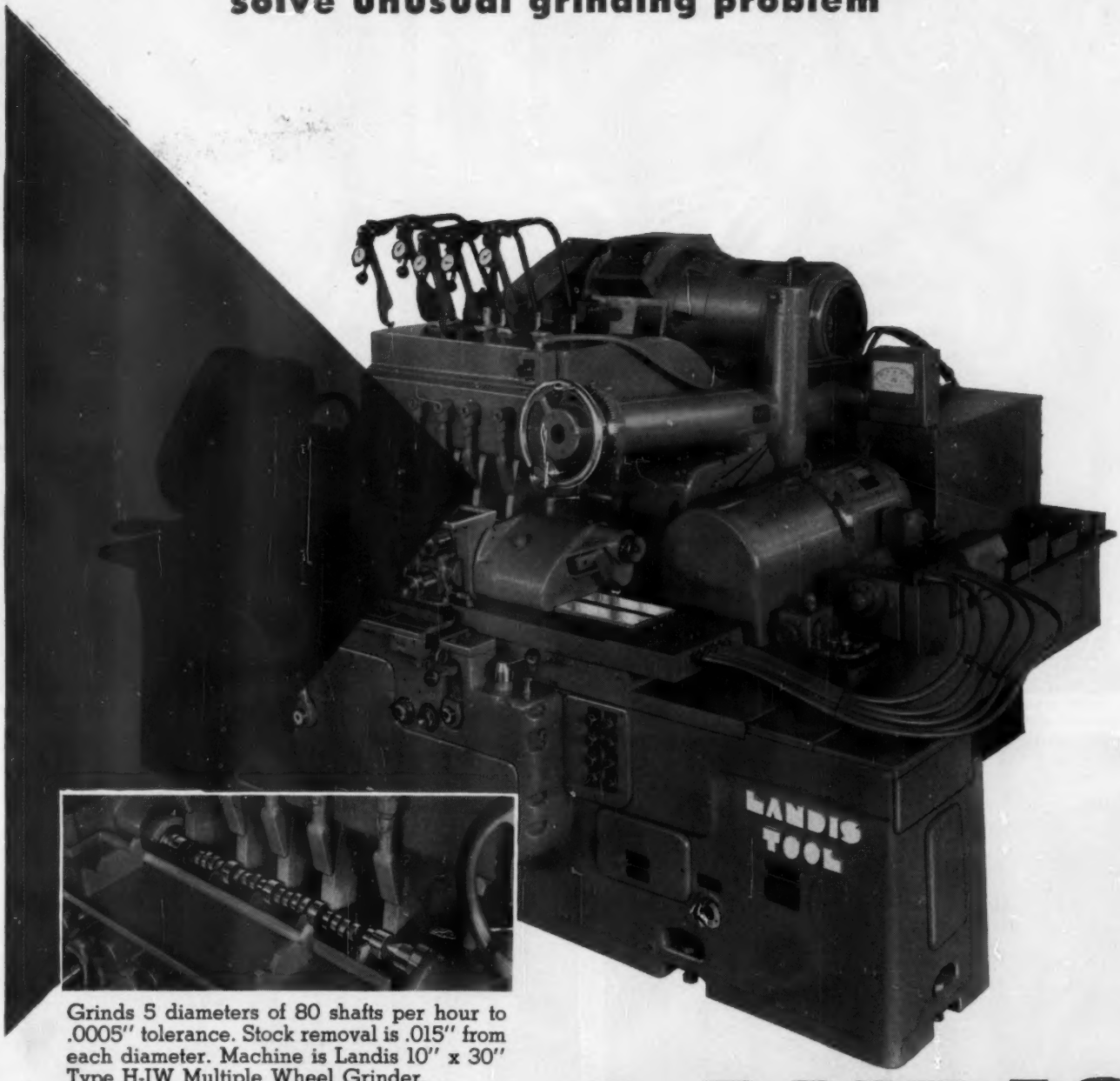
No Balance Weights Needed

Grinding wheels are never balanced on Landis 10" and 16" Multiple Wheel Grinders. Machine grinds to "tenths" at high production rates. An unusual example of Rigidized Microsphere bearings and spindle at work!



grinds to tenths

Rigidized Microsphere bearings and spindle solve unusual grinding problem



Grinds 5 diameters of 80 shafts per hour to .0005" tolerance. Stock removal is .015" from each diameter. Machine is Landis 10" x 30" Type H-IW Multiple Wheel Grinder.

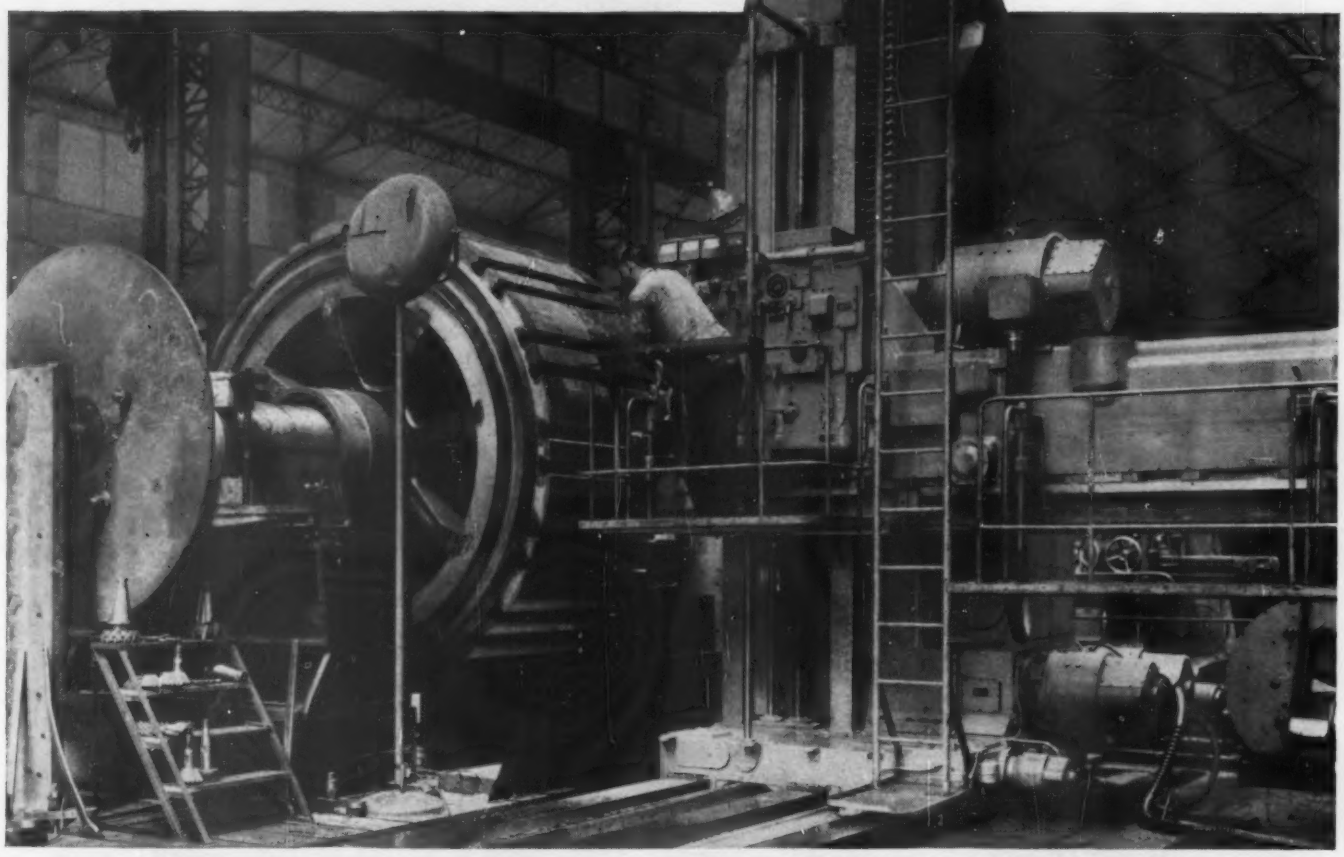
LANDIS TOOL COMPANY
WAYNESBORO, PENNA.

LANDIS

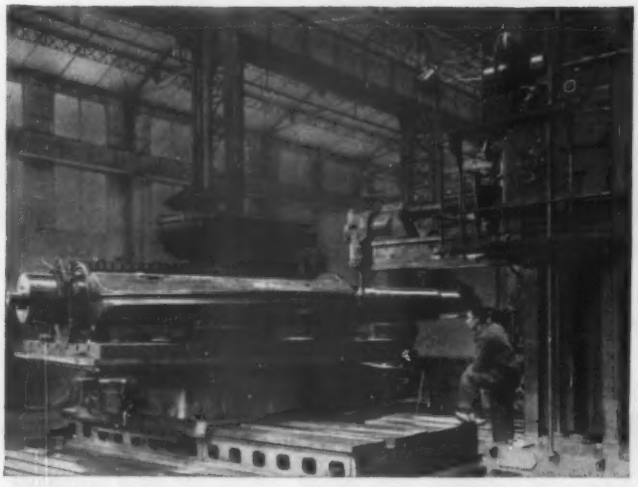
precision grinders

UNSURPASSED ADAPTABILITY

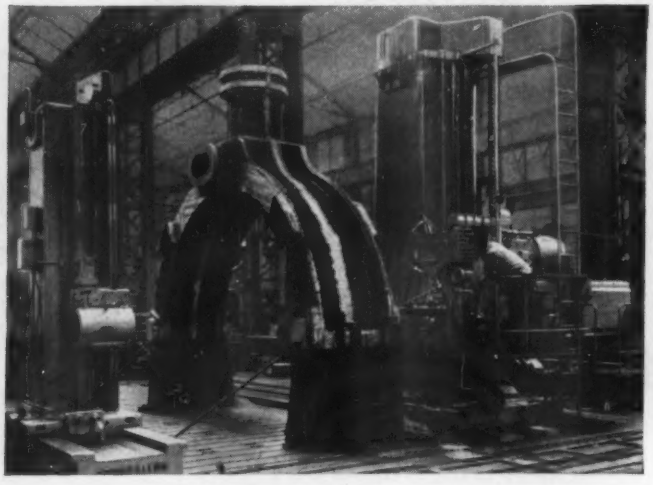
• Profiling rotor spider's rim for 32,000 kw generator, driven by propeller type hydraulic turbine, done on G&L 570-F, Horizontal Boring, Drilling and Milling machine. Rotor weighs 75 metric tons.



Societe Des Forges & Atelier du Creusot (Usines Schneider), France.



• Angular milling attachment, mounted on heavy-duty underarm, permits milling and grooving circular surfaces of steel turbine wicket gate. Rotary table, with ample power for feeds and rapid traverse, assures smooth, accurate milling of workpiece.



• Employing main spindle feed and vertical movement of headstock, operator performs angular and vertical milling of pads on weldment. All operations are controlled from platform or portable control station.

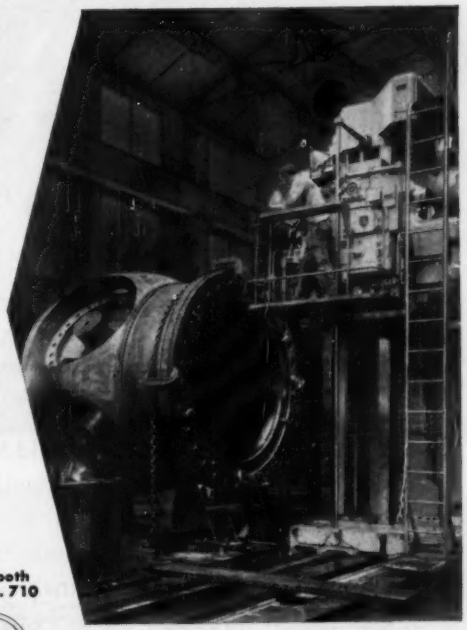
to machine difficult-to-reach surfaces

Societe Des Forges & Atelier du Creusot uses Giddings & Lewis Model 570-F Horizontal Boring, Drilling and Milling Machines with underarm support . . . attachments and accessories. Result — greatly extended scope of operations on huge workpieces.

Hydraulic turbine-generator units, swing jaw and gyratory crusher components and other large castings are only a few of the giants machined to exact tolerances on Giddings & Lewis Model 570-F (floor-type) Horizontal Boring, Drilling and Milling machines. Because these machines are able to perform a wide variety of operations in a single setup, they're always in great demand at Societe Des Forges & Atelier du Creusot (Usines Schneider), France.

The 50 Series machines, illustrated here, are equipped with 7" dia. main and 2.5" dia. auxiliary spindles, each covering a different range of speeds and feeds. Continuous feed facing and boring head permits even greater flexibility of operation involving machining of difficult-to-reach surfaces. Angular milling attachment, mounted on heavy-duty underarm support, allows milling, facing and boring operations at right angles to spindle as far as 60" from the headstock. What's more, use of a power-driven revolving table eliminates numerous extra set-ups of workpiece.

If you'd like to know how to reduce set-up time, speed-up production when machining huge workpieces, contact your Giddings & Lewis representative or write to factory.



Literature Available:

Ask for Catalog No. 50-F with details on 50 Series Horizontal Boring, Drilling and Milling machines.

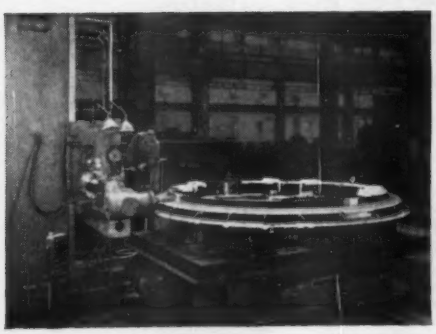
Booth No. 710

GIDDINGS & LEWIS MACHINE TOOL CO.

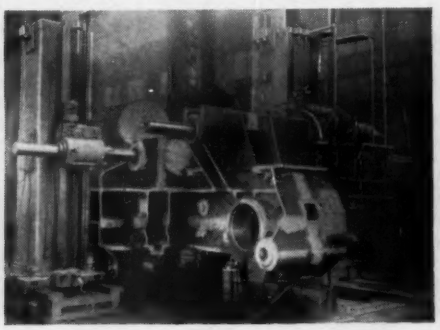
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open-side Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.

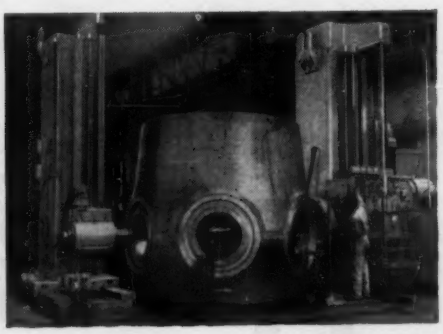
• Drilling, boring, reaming, tapping, back facing and countersinking a series of 100mm diameter holes in upper flange of hub for mounting adjustable turbine runner blades accomplished on G&L Model 570-F Horizontal Boring, Drilling and Milling machine.



• 90° angular milling attachment on underarm permits precise circular milling. Race width, 250mm; cutting depth, 4mm; circular feed, 20mm per min.



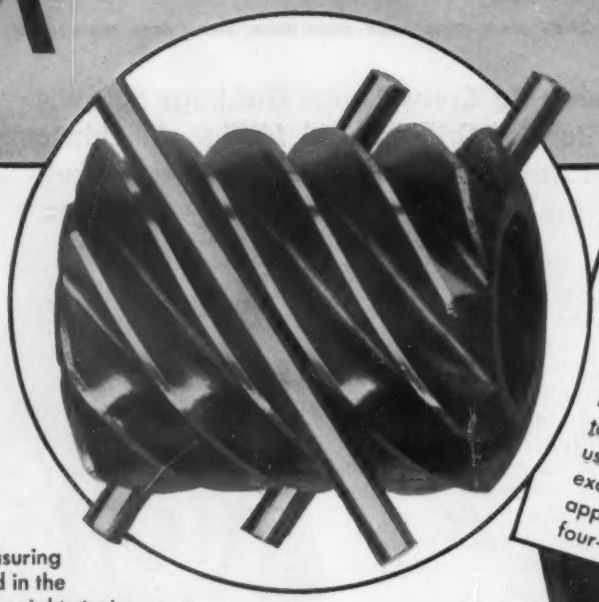
• Bearing and shaft bores of 27 (metric) ton jaw crusher frame are precision-machined on G&L Model 570-F machine. Long boring bars, heavy cutting tools are held in perfect alignment with G&L end-support.



• Steel hub (for Kaplan adjustable blade hydraulic turbine-generator unit) is line bored on G&L Model 570-F machine. Boring bar is mounted on continuous feed facing head which handles all boring operations.

VK THREAD MEASURING WIRES

▼ Standard equipment everywhere



Thread Measuring Wires placed in the grooves of an eight-start worm. Wires on the further side of the worm are separated by one thread groove. VK Catalog and Handbook No. 36 contains formulas and illustrations showing contact position of wires.

NEW MASTER FORMULA for the measurement of Screw Threads

The new Van Keuren Catalog and Handbook No. 36 presents the NEW Vogel Master Formula which makes it possible to easily compute the over-wire measurement of multiple-start worms and screws to a very high degree of accuracy without using trial and error methods. A numerical example is also presented showing the application of the Master Formula to a four-start ACME thread.

Van Keuren Measuring Wires are held to within .00002" for roundness, straightness and identity of the wires within a set, and are also held within .00002" of exact size. They are the accepted standard equipment for making pitch diameter measurements of taps, thread gages, precision threaded parts, hobs, worms, splines and gears. For the great majority of 60° Unified and American threads, the Set No. 20 pictured at the right will fill your needs. Similar sets are available for single-start threads of other pressure angles. For threads which have a lead angle greater than five degrees, or multiple-start threads and worms, special size wires should be used. Correct sizes and constants can be easily determined from the Van Keuren Thread Measuring Tables or from the new formulas presented in Catalog and Handbook No. 36.

Set No. 20 Thread Measuring Wires

Set No. 20 Thread Measuring Wires is a plant necessity for maintaining taps and thread gages within their limits for wear and for proving the pitch diameter of screws and threaded parts.

Price, High Speed Steel Wires $125.00
Price, Carbide Wires 450.00

Special wires from .002" to 2.000" diameter are made to any tolerance required.

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

VK

36th YEAR

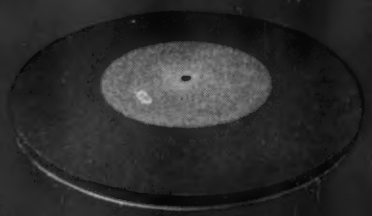
THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

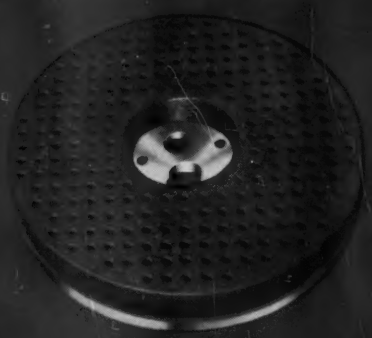
Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Laps and Surface Plates . . . Precision Lapping Service.

Gardner Wire-Lokt® Discs

Smooth face for most general purpose grinding jobs

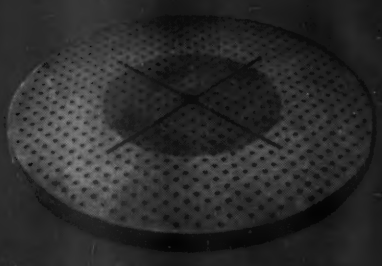


Combination grade maintains a uniform flat surface for the job requirement



Deep corrugated face provides fast, cool cutting

Combined smooth and corrugated face for shear cuts, cool cutting and good chip clearance



Combination grade and face with radial lines for even wear, cool cutting and uniform coolant distribution

How Gardner cuts grinding costs with the right abrasive for the job

—by recommending right type, grade and grain

—by selecting the best cutting surface

and

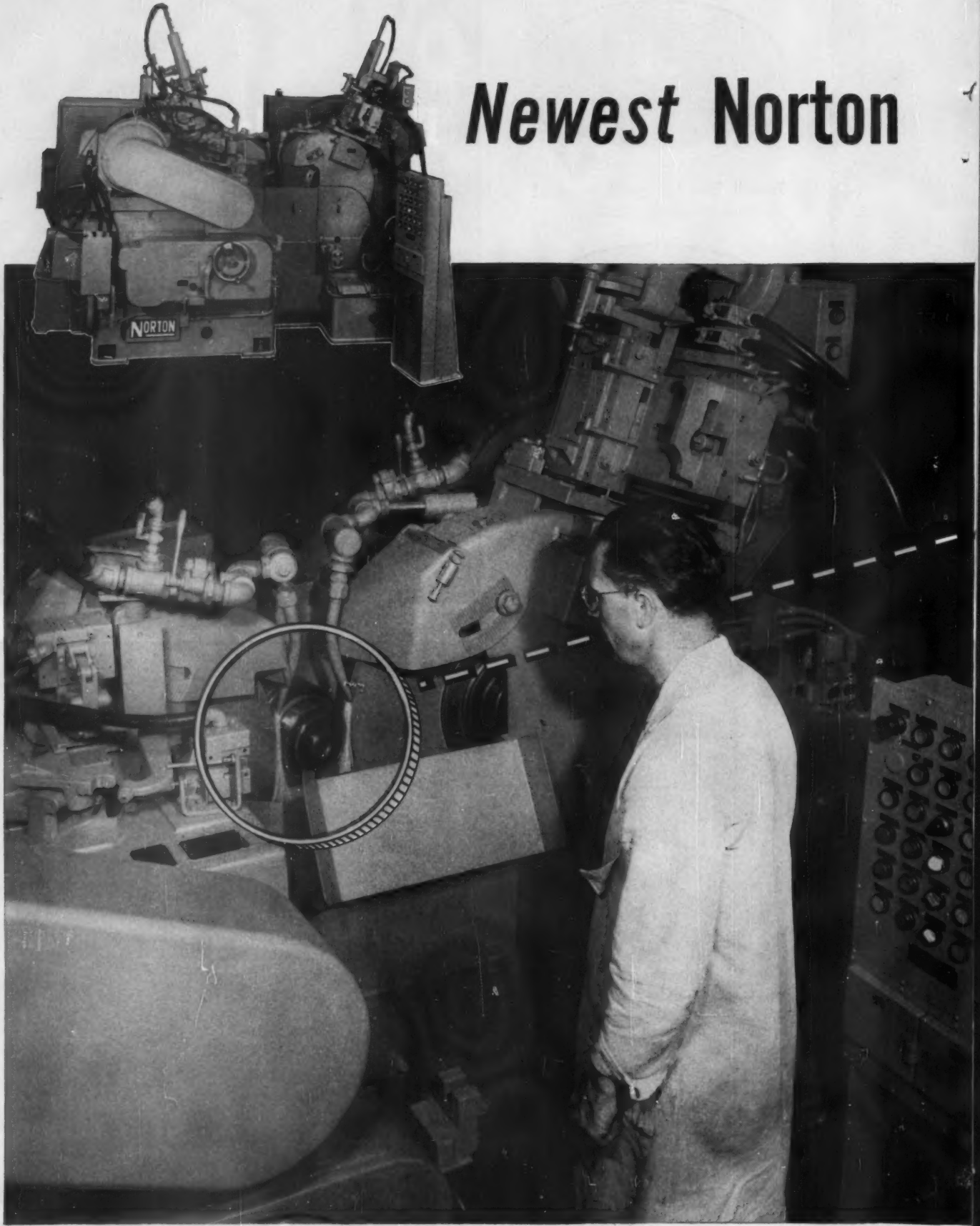
—by accuracy in filling repeat orders

GARDNER

abrasive discs

BELOIT, WISCONSIN

Newest Norton



The "Touch of Gold" In Multiple Diameter Grinding. This Norton Type CMS-1 Semiautomatic Multi-Wheelslide Cylindrical Grinder is set up to grind two conical surfaces simultaneously in automatically controlled plunge grinds. The wheelslides, opposed here, may be positioned in-line if the job requires.

grinder for multiple diameters

The Type CMS-1 Semiautomatic Multi-Wheelslide Grinder handles jobs impossible on ordinary multi-wheel machines

Here's a brand new Norton grinder with a special capacity for high production, low cost grinding of multiple diameter work.

The Type CMS-1 Semiautomatic Multi-Wheelslide Cylindrical Grinding Machine cuts production time and expense in a number of different ways. It grinds with top speed and accuracy. It reduces grinding wheel costs. Most importantly, it eliminates the need for separate grinds on separate machines.

Advanced Multi-Wheelslide Arrangement

During building, the Type CMS-1's sturdy, unitized wheelslides are positioned — opposed or in line — for specific job requirements. In use, slight angular or lateral adjustments may be made when setting-up. Each wheelslide mounts one or more 30" grinding wheels, with the type of work-holding equipment depending on the job. Slides operate in unison during production, but may be individually controlled for set up.

Other Outstanding Features

- Central, one-lever control of the automatic grinding cycle — plus automatic, electrically timed termination of the cycle — for greatly simplified operation.
- Two-rate automatic feed assures ideal conditions for rapid stock removal, with highest accuracy and finish.
- Convenient wheel feed hand wheels have "click-count" indexing, permitting feed adjustments in increments of "tenths." This simplifies size control in setting-up and in initial operation.
- Individual push-button-operated jogging control of wheelslides aid production by simplifying size control.
- Automatic wheel guard type truing devices operate consistently at predetermined speed and feed. Control of the amount of abrasive removed is close and uniform, with compensation of wheelslide setting for wheel diameter reduction. Results are most efficient, effortless truing, with reduced wheel cost per piece ground.

Get All The Facts

on the new Type CMS-1 grinder from your Norton Representative. Learn how you can improve your competitive position by replacing two or more old grinders with this ultra-modern machine. Or write direct to us for the whole story. And remember: only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

To Economize, Modernize With NEW

NORTON

GRINDERS and LAPPERS

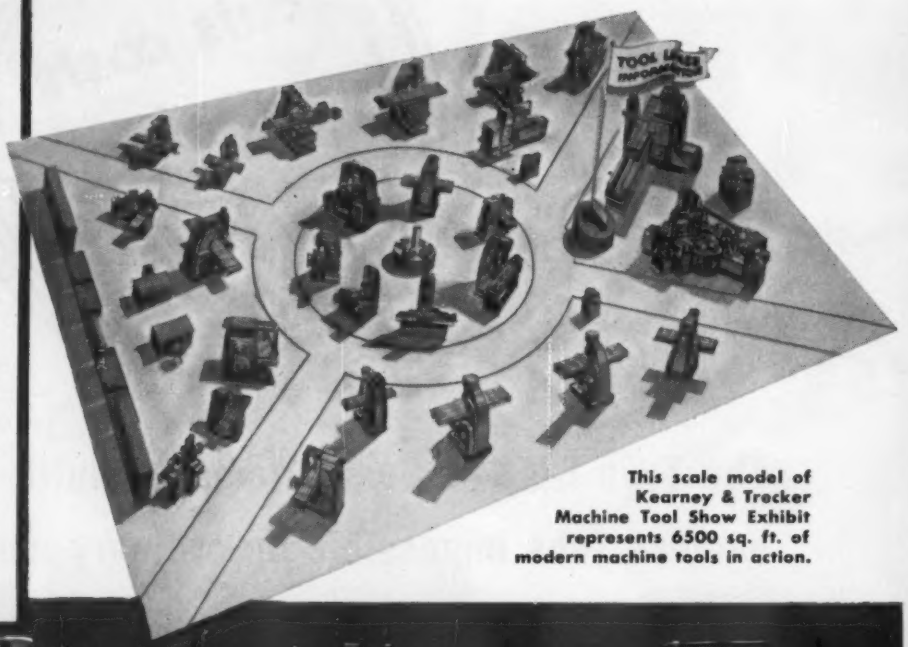
Making better products... to make your products better

District Sales Offices: WORCESTER • HARTFORD • NEW YORK • CLEVELAND • CHICAGO • DETROIT

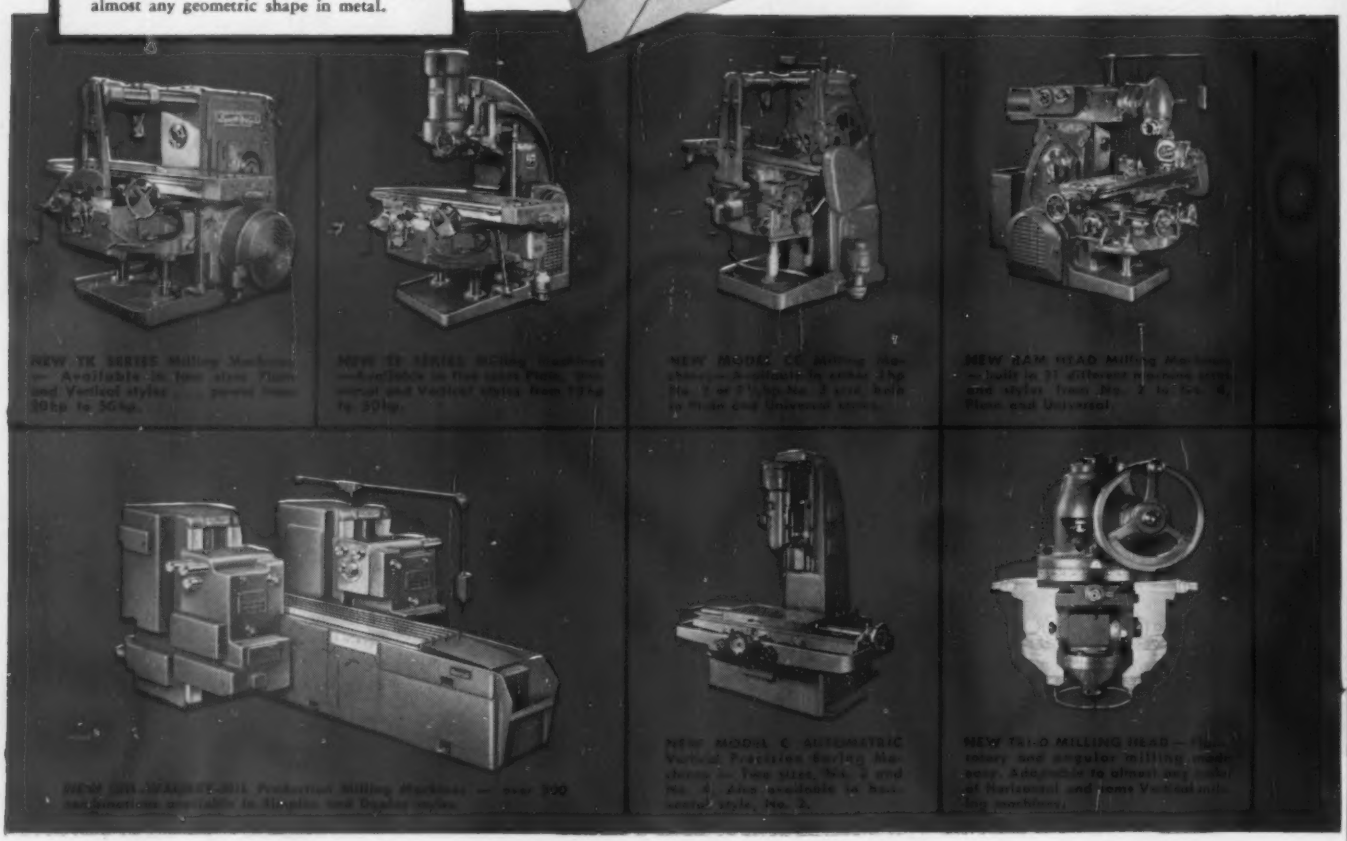
KEARNEY & TRECKER
expansion and new

See these outstanding machines in Booth 508

- ★**New TK Series Milling Machines** — incomparably modern titans of general purpose production!
- ★**New TF Series Milling Machine**—strikingly new models featuring remarkable twin-screw knee support.
- ★**New Model CE Milling Machines**—the simplified, precision-built, economy producer for schools, maintenance and small tool work.
- ★**New Ram Head Milling Machines** — versatile performers featuring combination arrangements of horizontal, vertical and universal spindles.
- ★**New Mil-waukee-Mil Series Milling Machines** — flexible, power laden, broad capacity, bed-type production tools.
- ★**New Autometric Precision Boring Machines** — superb vertical models introducing a non-wearing twin-screw measuring system.
- ★**New Automatic Transfer Machines** — Quill Feed unit, Way-Type Drilling unit, Lead Screw Tapping unit, Rotary Index Table, Feed Slide.
- ★**New Compudex** — the precision indexing computer for rotary tables and dividing heads.
- ★**New Tri-D Rotary Milling Head** — the amazing attachment which will produce almost any geometric shape in metal.



This scale model of Kearney & Trecker Machine Tool Show Exhibit represents 6500 sq. ft. of modern machine tools in action.



unfolds results of $18,700,000 product development program

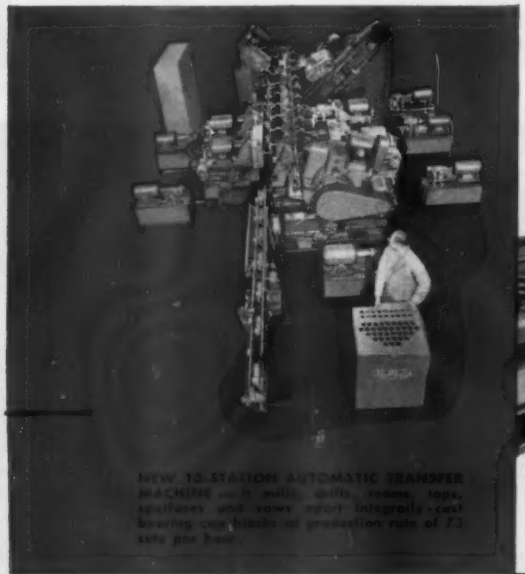
An extraordinary investment to bring you MORE PRODUCTIVITY and QUALITY . . . GREATER ECONOMY and PERFORMANCE in the new machine tools you buy from KEARNEY & TRECKER

Yes, the 1955 Kearney & Trecker Machine Tool Show story reflects a tremendous investment any way you look at it—$3,500,000 in new buildings and facilities; $8,900,000 in new tools and equipment; $6,300,000 in research and new product development.

And at the Show you'll see the positive results of this unprecedented eight-year growth and development program. You'll see 31 unusual exhibits featuring among them not one, but four new lines of knee-type milling machines comprising 81 different models, styles and sizes; an entirely new line of medium size bed-type production milling machines with electro-hydraulic pendant control; a new group of vertical precision boring machines; new attachments for rotary milling and precision index computing; automatic transfer type equipment — all of this and more to be seen and demonstrated in Booth 508.

Today, Kearney & Trecker offers you standard and special production machines that can meet any of your needs — with more productivity and quality, with greater economy and performance than ever before. What's more, you can obtain new machines either by outright purchase, conditional sales agreement or any of three Kearney & Trecker Tool-Lease plans.

See or write your nearest Kearney & Trecker representative. He'll be glad to discuss your production requirements and what these new Kearney & Trecker machines can do to meet them.



NEW GANTRY-TYPE WING SKIN TRACER-CONTROLLED MILLING MACHINE — A 125-ton, 360° and rise and fall functioning giant of production, which is typical of recent Kearney & Trecker developments for the aircraft industry. Similar machines can be seen in operation at Kearney & Trecker's new Special Machinery Division plant in Milwaukee during the Show.

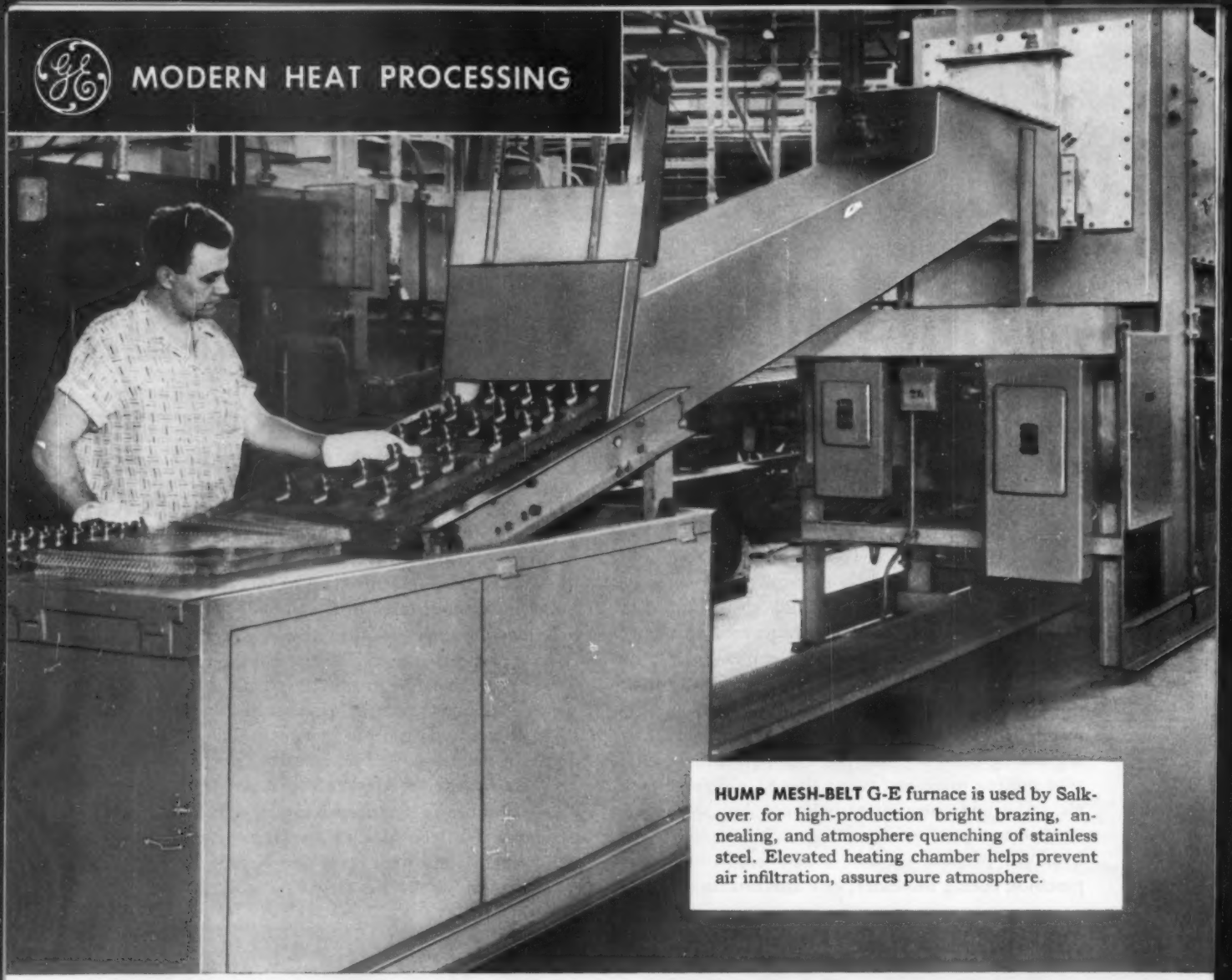
THE MACHINE TOOL SHOW
CHICAGO, ILL.
INTERNATIONAL AMPHITHEATRE
BOOTH 508

Kearney & Trecker
CORPORATION
MILWAUKEE 14, WISCONSIN

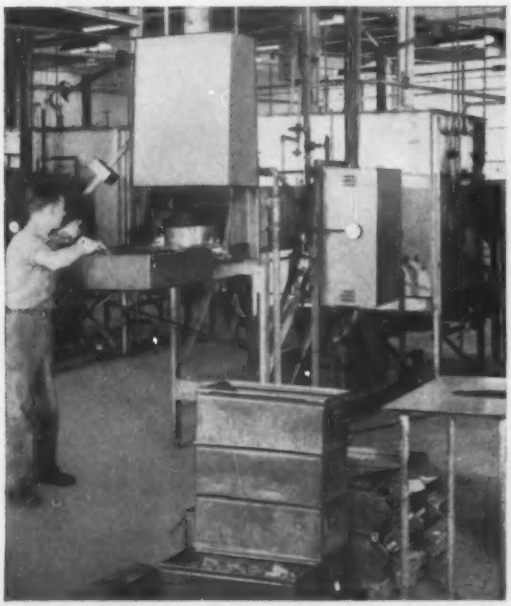
KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS ®

BUILDERS OF PRECISION AND PRODUCTION MACHINE TOOLS SINCE 1898

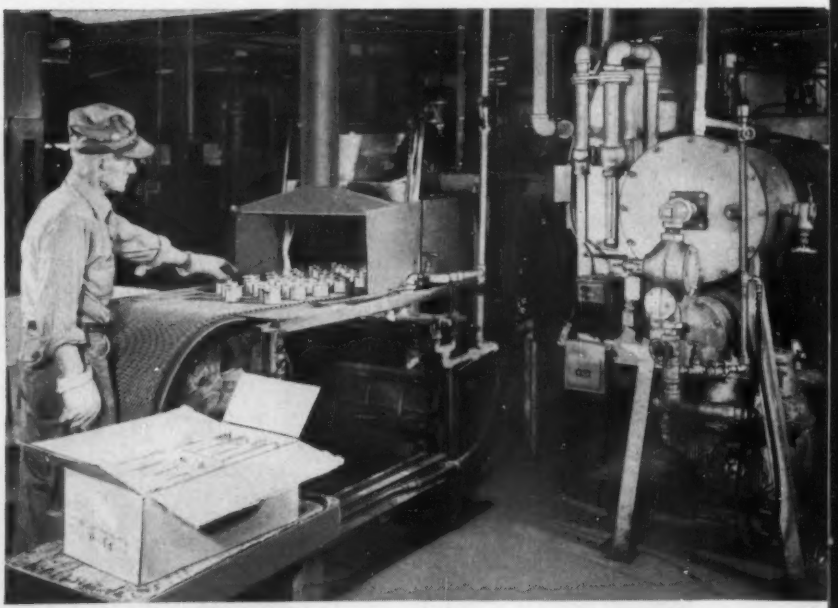
MODERN HEAT PROCESSING



HUMP MESH-BELT G-E furnace is used by Salkover for high-production bright brazing, annealing, and atmosphere quenching of stainless steel. Elevated heating chamber helps prevent air infiltration, assures pure atmosphere.



G-E BOX-TYPE BRAZING FURNACE, is one of three used by Salkover Metal Processing for low-volume, high-quality copper brazing and annealing.



CLEAN PARTS EMERGING from Salkover's G-E mesh-belt furnaces are placed directly in shipping boxes. No need for pickling, grinding or polishing because protective atmosphere keeps parts free of scale.

PROBLEM:

How to avoid the high cost of forging and machining

SOLUTION:

Brazing with G-E Furnaces Cuts Costs 25 to 50% for Salkover Customers

Many metal-product manufacturers are constantly faced with the same problem: how to avoid the high cost of forging and machining large volumes of metal parts. More and more of these companies in the Chicago area are finding the solution: fabrication . . . and brazing with Salkover Metal Processing of Illinois, Inc.'s new G-E furnaces.

SINCE SWITCHING to G-E furnace brazing, Salkover's customers have gained savings of between 25 to 50%.

Mr. Lee Mathis, Superintendent of Salkover, explains how their G-E furnaces made these savings possible: "With our seven G-E brazing and bright-annealing furnaces I can give my customers superior quality work. The furnaces in our new, modern heat-processing plant include box, mesh-belt, and roller-hearth types. And we're sold on them for three reasons: the heating units really last, over-all maintenance is very low, and the furnaces also have high productive capacity—all pretty important for the high-volume runs our customers bring in."

THE HEATING UNITS in the General Electric furnaces have so far given Salkover up to two years' life, with no intermediate maintenance. Maintenance of other component parts and down time of the furnaces have also been low.

Also, power input is high and thermal losses low. These features permit Salkover to hold down brazing and annealing costs to customers.

ASK FOR THE SERVICES of your local G-E Apparatus Sales Representative. He will show you how the installation of a G-E furnace can help you cut processing costs and increase the quality of your product.

GENERAL ELECTRIC

VERSATILE G-E ROLLER-HEARTH furnace with return conveyor pays for itself quickly at Salkover. Performs a variety of high-production jobs—brazing, bright annealing, sintering, bright normalizing.

FREE PROCESS BULLETINS

Please send me the Modern Heat Processing and technical bulletins I have checked below.

- ☐ Protective Atmospheres, GEA-5907
- ☐ Furnace and Induction Brazing, GEA-5889
- ☐ How and Where to Use Electric-Furnace Brazing, GEA-3193C
- ☐ Mesh-Belt-Conveyor Electric Furnaces, GEA-4071A
- ☐ Electric Box Furnaces With Cooling Chamber, GEA-4066
- ☐ Roller-Hearth Electric Furnaces, GEA-4072A
- ☐ Electric Furnace Brazing, GER-106
- ☐ Furnace Brazing of Machine Parts, GER-339

Section B721-5
General Electric Co.
Schenectady 5, N. Y.

Name .....

Company .....

Address .....

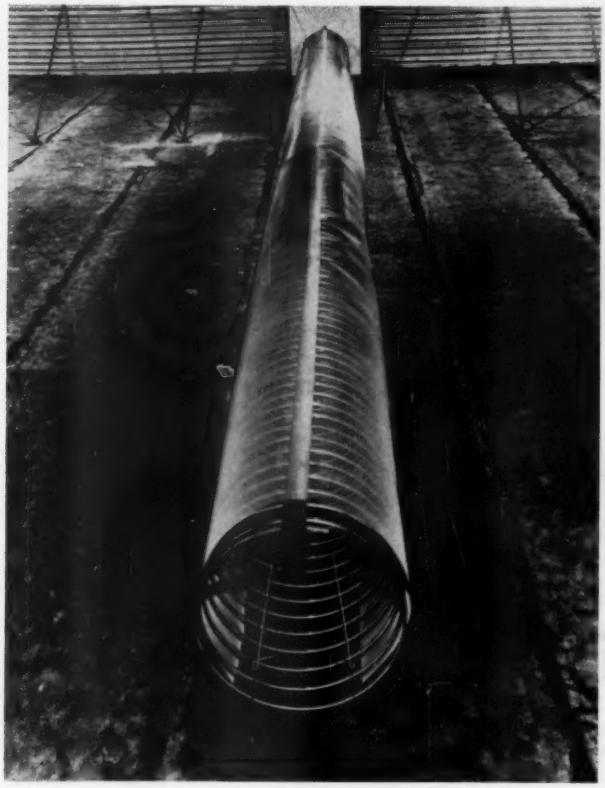
City ..... State .....

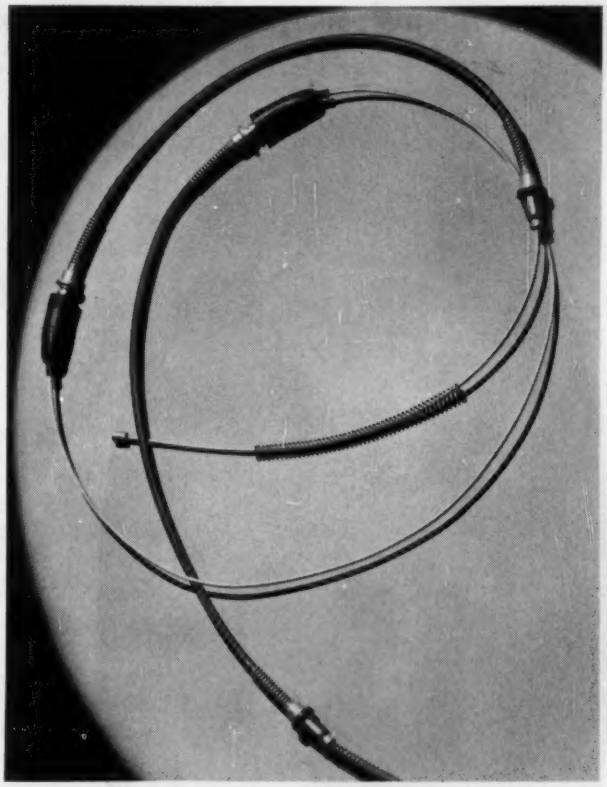
Can you guess what these American

A _____

Quality Springs are used for?

B _____ C _____





ANSWERS

A **CAR-PROOF.** You're looking at the wall of a striking new parking garage just erected in Chicago. American Steel & Wire furnished miles of stainless steel strand that runs continuously from the roof to the ground—where it is stretched tight by means of American Quality Springs. Appearance is breathtaking, and the novel construction prevents cars from rolling off the concrete slabs.

B **ONE LUNG GRAIN BIN.** When grain is stored, it *must* be adequately ventilated. American Steel & Wire produced thousands of these enormous steel "springs" that can withstand tremendous radial loads. In fact, they are laid on the floor of the bin, wrapped with AS&W Insect Screen, then covered with tons of wheat. Air can then be pumped through the tube, and the wheat stays dry and in good condition.

C **YOU USE IT ALMOST EVERY DAY.** It's not a terrifying medical instrument. Rather, this collection of cable, springs, clips and rubber boots is the entire parking brake assembly for a famous automobile. This entire unit was produced by American Steel & Wire.

●Remember, American Steel & Wire can supply *completely fabricated* wire and spring assemblies in quantity. Get in touch with your AS&W salesman . . . take advantage of American Steel & Wire quality—and *price*.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

USS AMERICAN QUALITY SPRINGS

UNITED STATES STEEL

Users tell you how
These two cut-off

On-the-job reports prove the Norton rubber bonded R50 and resinoid bonded

For wet cutting

Users' reports on how the Norton R50 adds the profit-boosting

"TOUCH of GOLD"

- **Wheel life tripled**
  Massachusetts tool manufacturer says R50 wheel, cutting-off high speed steel tap stock, lasted three times as long as best competitive wheel. Job required very smooth cut, with no burr or burn.
- **Best in every way**
  Illinois maker of combination doors and windows reports R50 wheel produced best quality cut, fastest cutting action, longest life for cutting extruded aluminum frames.
- **Longer lasting, superior cutting**
  Rhode Island oil seal manufacturer reports R50 wheel, cutting-off stainless steel, gave considerably longer life with better quality cut than any other wheel.
- **70% more durable**
  New York steel company says R50 wheel beat durability records of two best previous cutting-off wheels by 70%. Work was on high speed and carbon tool steels.
- **First among four**
  Pennsylvania manufacturer of coal mine bits reports R50 best wheel used for cutting alloy steel bit stock. Far superior, in quality of cut and durability, to three other wheels tried.
- **Best wheel ever used**
  New Jersey sporting goods manufacturer, using R50 for cutting off tubing for golf club shafts, rates this wheel far above all others for performance and economy.

The Norton R50 rubber bonded cut-off wheel is designed especially for wet cutting of ferrous bar stock up to 6" diameter. It is the wheel to use where quality of cut, without burning, is important. Built-in chip clearance — unusual in this type of wheel — is one of many "Touch of Gold" advantages for better cutting performance and longer wheel life.

Is wet or dry cutting best for YOU? — Ask your Norton distributor

Are your cutting-off jobs marred by excessive burring or burning? Are you case-hardening the work, so that it causes tool breakage? Are you wearing out your wheels too fast on high production runs? Are you looking for finished cuts — and not getting them?

If you're bothered by any of these cutting-off problems, perhaps you ought to check your methods as well as your wheels. You may, for example, be dry cutting, when wet cutting would be more efficient — or vice versa.

Your Norton Distributor's abrasive specialist, or your Norton Abrasive Engineer is ready to give you practical information on cut-off *methods* — information that can save you money every day.

See your Distributor, or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

wheels top all others

B9 wheels save time and money on the widest range of wet and dry applications

For dry cutting

Users' reports on how the Norton B9 adds the profit-boosting

"TOUCH of GOLD"

- **Five times better**
  California naval shipyard re-orders B9 wheel for aluminum cutting jobs. Reason: B9's 5 to 1 superiority over best previous wheel.
- **100% more cuts**
  New Jersey foundry switched to B9 wheels for cutting "Christmas tree" risers from precision castings, after tests in which B9 gave twice as many cuts.
- **Gave a 10 to 1 advantage**
  Indiana tool company praises B9 wheel as easily the best ever run for cutting-off miscellaneous hardened tools, delivering a 10 to 1 advantage over best of competition.
- **Best general purpose wheel**
  Massachusetts manufacturer of molded rubber products reports the B9 best all-around cut-off wheel in their experience. Chief jobs were cutting various types of steel up to 3" diameter.
- **Unbeatable on Inconel**
  Pennsylvania bearings company says it found no other wheels to compare with the B9 for cutting Inconel bar stock. Outperformed competitive wheels on all counts.
- **565 more cuts**
  Massachusetts manufacturer of textile equipment reports B9 wheel produced 700 cuts on 1 x ½ x ⅛" steel channels. This topped previous wheel's record of 135 cuts by 565 — for five times longer wheel life.

The Norton B9 resinoid bonded cut-off wheel is recommended for high production dry cutting jobs, especially where fast rate of cut is essential. It is made with either smooth sides or the rough "F" sides for more clearance in the cut. It will give you long, economical "Touch of Gold" performance in the widest range of ferrous and non-ferrous applications.

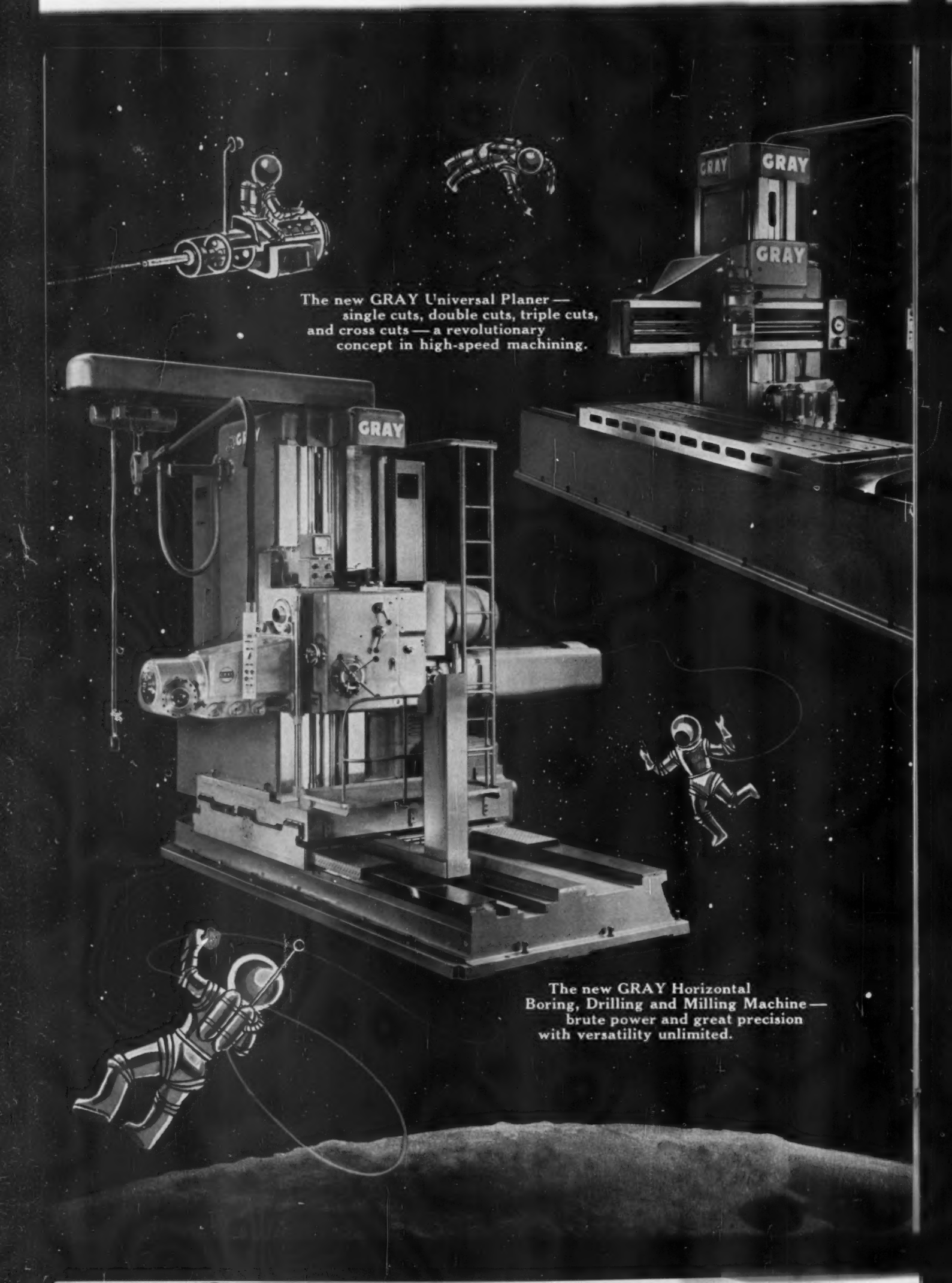
Making better products . . . to make your products better

NORTON

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

W-1600



The new GRAY Universal Planer —
single cuts, double cuts, triple cuts,
and cross cuts — a revolutionary
concept in high-speed machining.

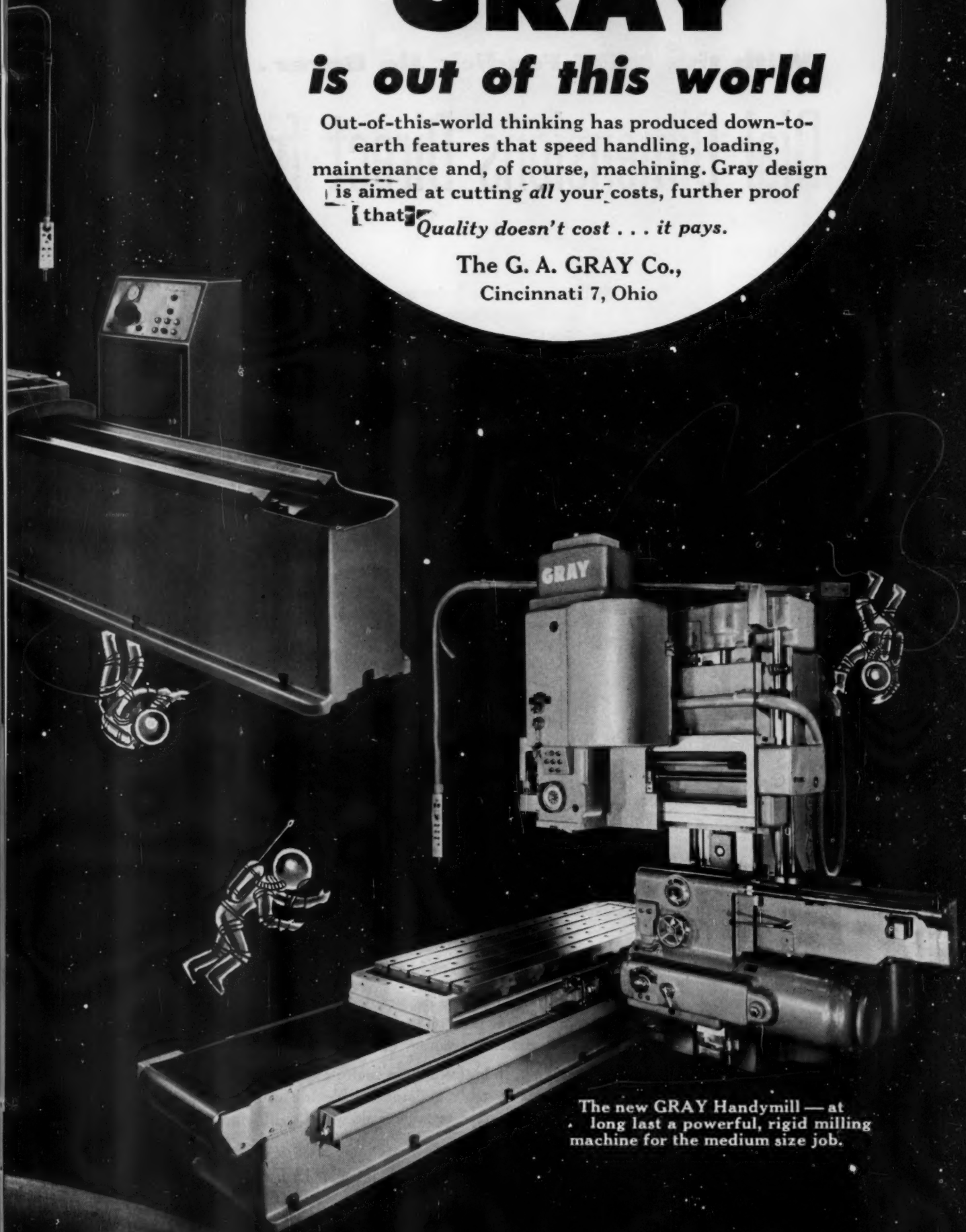
The new GRAY Horizontal
Boring, Drilling and Milling Machine —
brute power and great precision
with versatility unlimited.

GRAY

is out of this world

Out-of-this-world thinking has produced down-to-earth features that speed handling, loading, maintenance and, of course, machining. Gray design is aimed at cutting *all* your costs, further proof that *Quality doesn't cost . . . it pays.*

The G. A. GRAY Co.,
Cincinnati 7, Ohio



The new GRAY Handymill — at long last a powerful, rigid milling machine for the medium size job.

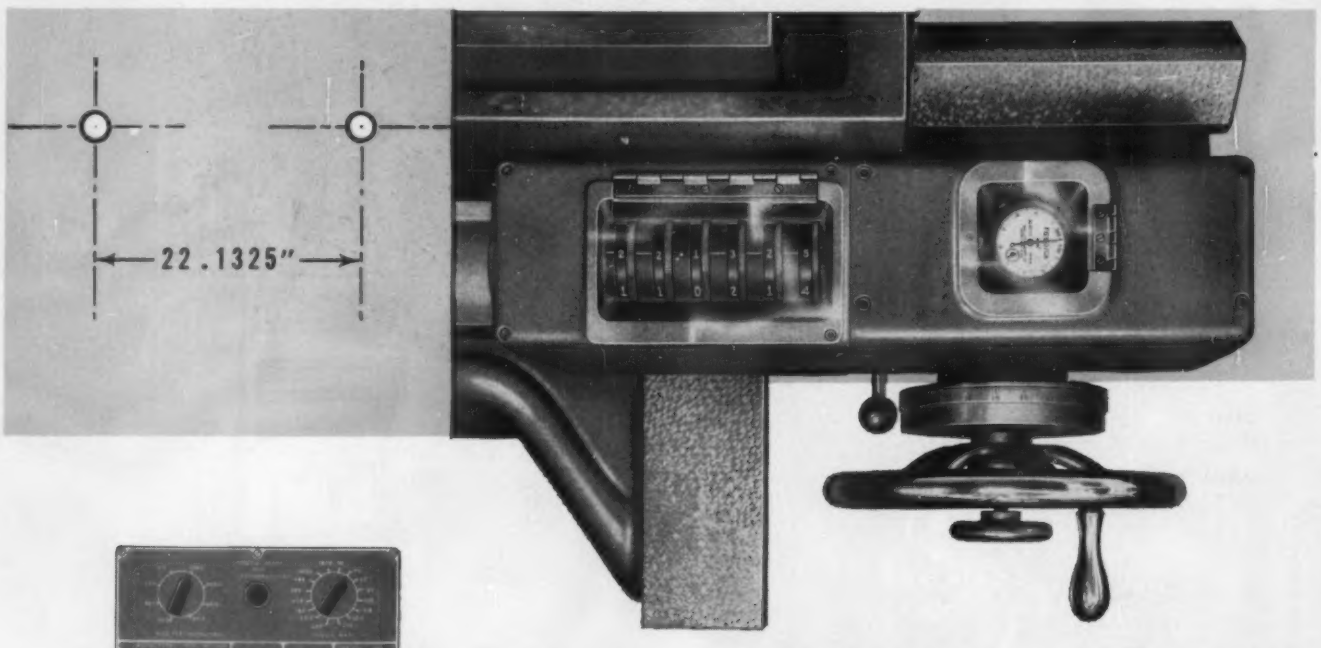
With the NEW Fosdick Jig Borer . . .

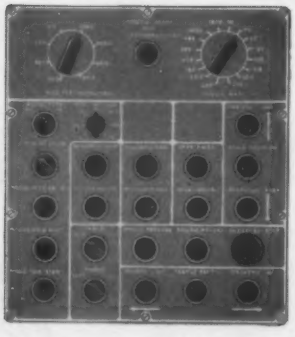
Dial Dimensions Direct from Print

This is DIRECT DIMENSION Measuring!

● This new and exclusive measuring system is the simplest, the most direct ever conceived for a jig borer! It will measure with precision to ± .0001". And the operator need not be highly skilled.

Dimensions from the blueprint are simply set on direct-reading drum dials, one for longitudinal, the other for transverse position. Easily-read numerical dials minimize errors. The finest Class 'A' gages . . . permanently sealed against dust and never handled by the operator . . . provide consistent precision.





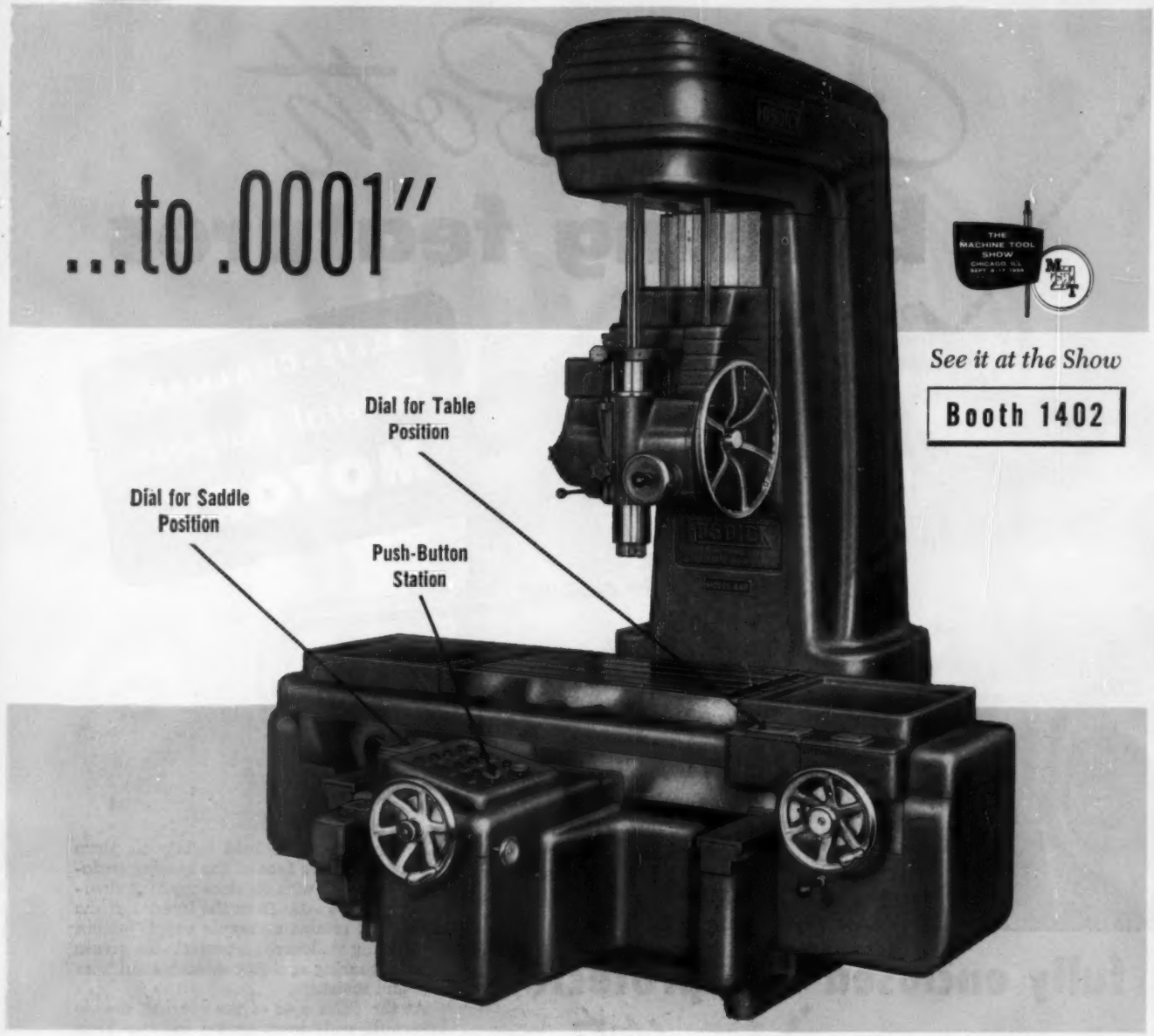
Press a Button . . . Table and Saddle Position Automatically!

Once dials are set, press the positioning button. Table and saddle will automatically position themselves to the dimensions set on the dials. We guarantee accuracy of ± .0001"!

In addition, push-button station controls spindle feeds and speeds; milling feeds to table and saddle; electric clamp to table and saddle; rapid traverse to table, saddle and quill; emergency stop.

NEED DRILLING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!

...to .0001"



See it at the Show

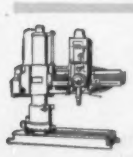
Booth 1402

Like the scores of Fosdick Jig Borers in plants throughout the U. S., this new machine will perform consistently to ± .0001" . . . in measured table and saddle position as well as hole size. In addition, a new degree of speed and convenience has been attained in our exclusive Direct Dimension measuring system.

Other major advancements in this machine contribute to a long life of consistent precision performance. Our new quill bearing design locates ball races permanently at top and bottom of head, regardless of quill position. Gears are hardened and ground and are operated by magnetic clutches.

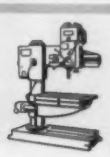
Other features include – 16 spindle speeds and 8 feeds, both *preselected* from push-button station. Rapid Traverse to head with electric clamping. Rapid traverse to quill (extra). Electronically-controlled milling feeds from ¾" to 15" per minute. Table sizes – 22" x 44", 22" x 54".

Write today for bulletin containing full description.


Radial Drills

Jig Borers

Sensitive and Upright Drills


Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

Get Both
bearing features

The bearing cap is held tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure . . . protects the grease and the bearing against contamination from dirt and moisture.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

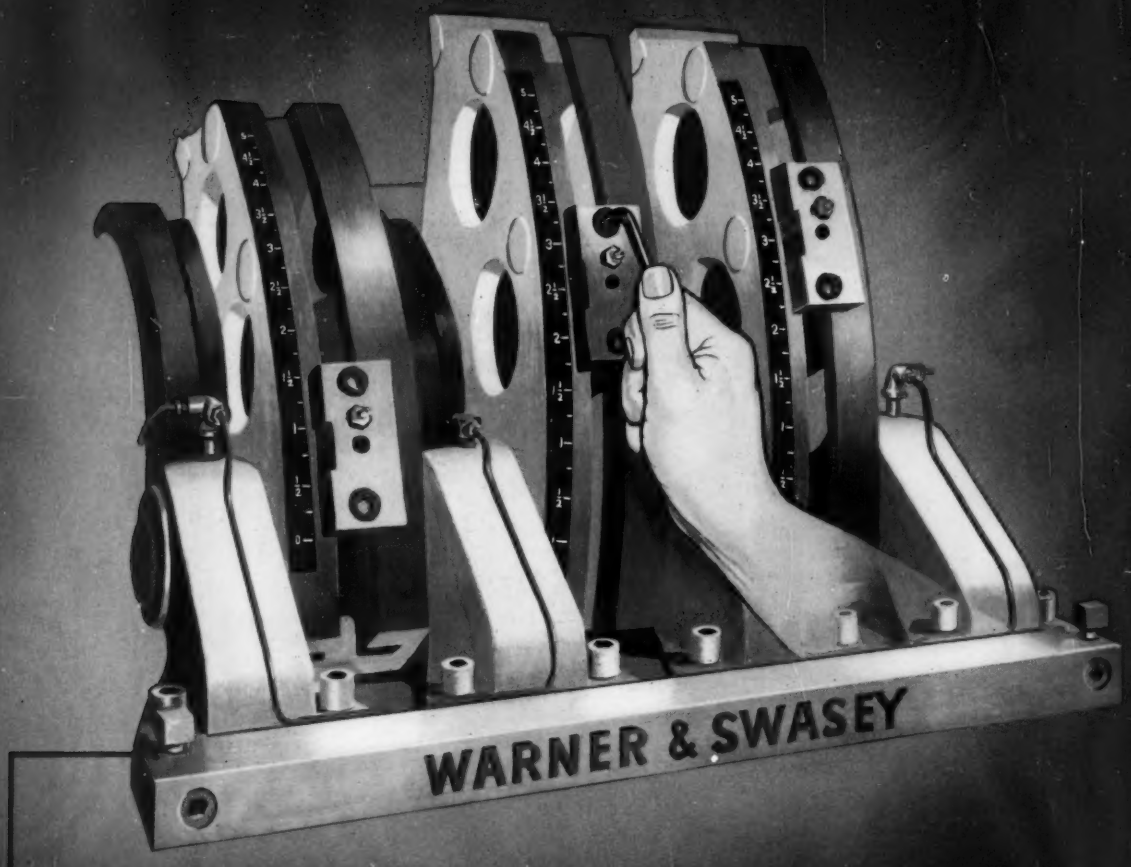
fully enclosed and protected
. . . yet
easy to grease

You can lubricate the bearings without dismantling the motor. Pipe-tapped holes in the bearing housings at two points provide both means for inserting new grease and a means of flushing out old grease.

Look for the extra bolts on the end housing . . . the sign of greater value. Ask your Allis-Chalmers representative or Authorized Distributor to show you a cutaway section of this maintenance-cutting design. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B6210.

A-4608

ALLIS-CHALMERS



AUTOMATICS

that crack the *break-even* barrier

Through their advanced design, Warner & Swasey
Automatics open for you unexplored areas of profit
in high precision, small lot production.

THE WARNER & SWASEY COMPANY • CLEVELAND 3, OHIO

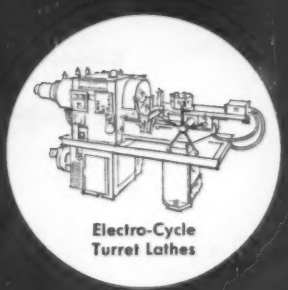
SEE
WARNER & SWASEYS
IN OPERATION
ON TYPICAL
SHOP JOBS

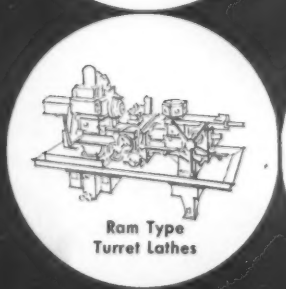
THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

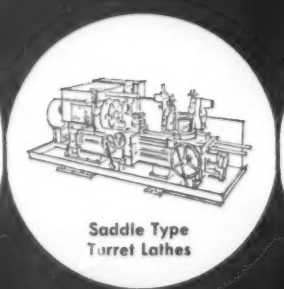
Most folks, we believe, go to the Machine Tool Show to take home ideas on how to do their own work more efficiently by seeing the latest machines and techniques available.

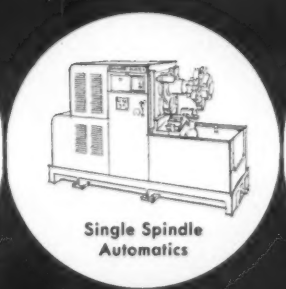
And we believe we can help you spend your time more profitably by showing you our machines turning the kind of jobs you encounter every day back home — the kind you're most interested in.

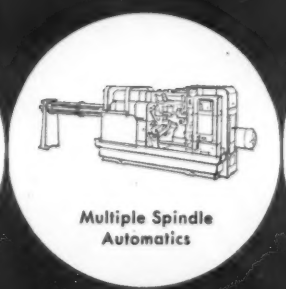
That's exactly what you'll see at the Warner & Swasey booth — the most modern machines available, utilizing the latest turning techniques, turning out typical shop jobs. You are cordially invited to visit us at 717.

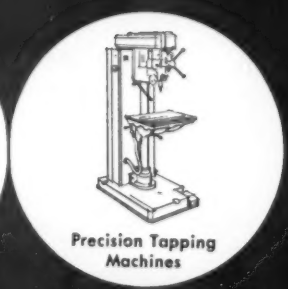

Electro-Cycle Turret Lathes


Ram Type Turret Lathes


Saddle Type Turret Lathes

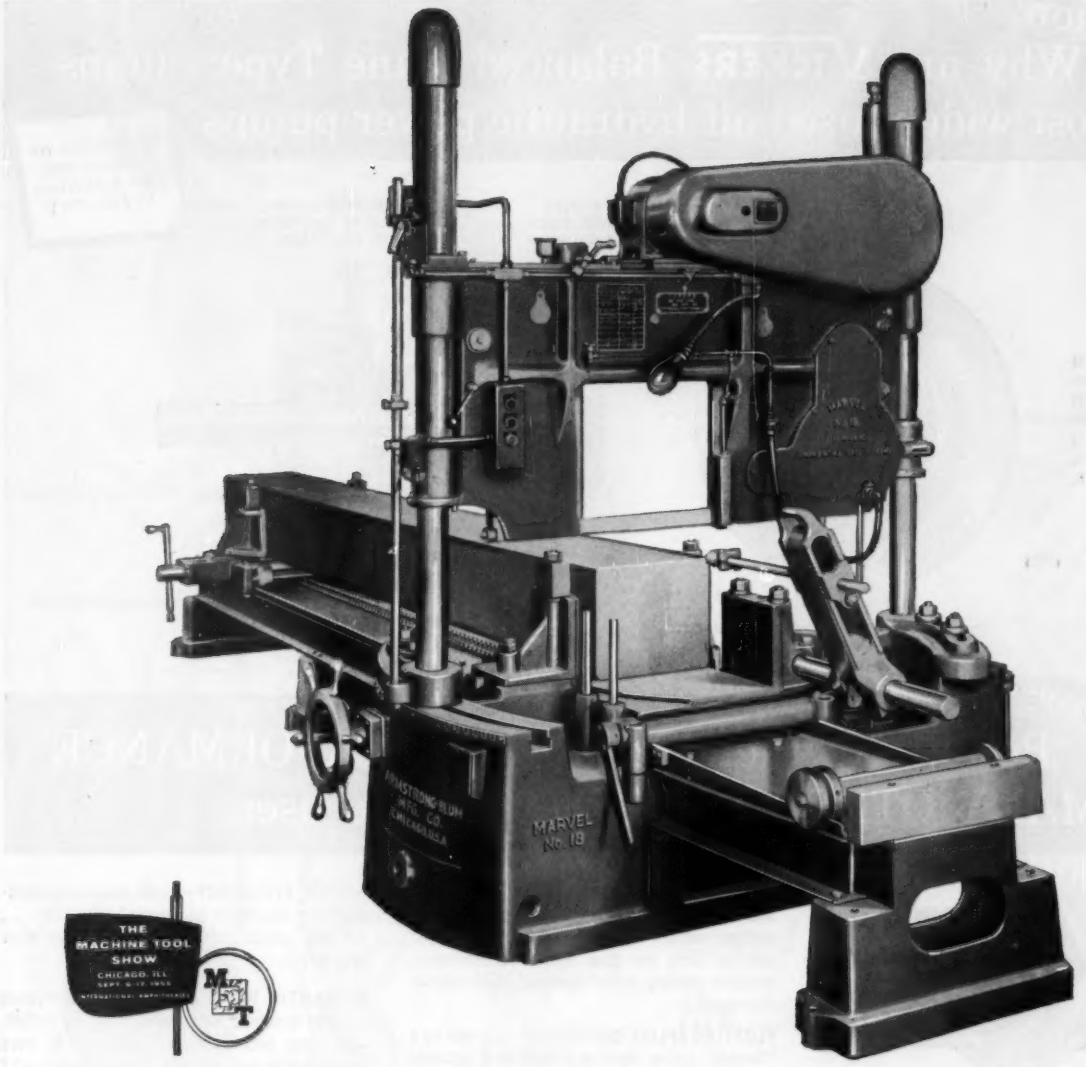

Single Spindle Automatics


Multiple Spindle Automatics


Precision Tapping Machines

75TH ANNIVERSARY YEAR
WARNER & SWASEY
Cleveland
PRECISION MACHINERY
1880 — 1955

NO MATTER WHICH WAY YOU TURN...
WARNER & SWASEY CUTS COSTS



No Job too big or too tough . . .

for MARVEL "*Giant*" Hack Saws

These giant MARVEL Hydraulic Hack Saws (No. 18, Capacity 18″ x 18″; and No. 24, Capacity 24″ x 24″) were *basically* designed for rapid and economical cut-off of BIG WORK. They are not merely "conventional" designs "stretched" to big capacity. They are truly designed and built with the ruggedness and rigidity necessary to withstand the rough treatment of sawing big work, even though the work is in the "toughest of the tough" alloys.

They are reliably fulfilling the cut-off requirements in innumerable steel mills, forge shops, structural shops, warehouses, and machine shops, with assured low tool cost and minimum kerf loss of steel.

In addition to cutting-off, they are reducing costs by eliminating further machining operations. Heat treated die blocks are being reclaimed for re-sinking by sawing off the worn face; columns, beams, pipe, and tubing are being sawed to *finished*, square ends, eliminating milling; angular sawing is done conveniently by swinging the upper structure on the base, to any angle up to 45 degrees—*without moving the work*.

Contemplating the modern trend toward ever tougher steels and larger sizes, these are the logical sawing machines to buy, not only for today's needs but for tomorrow's as well.

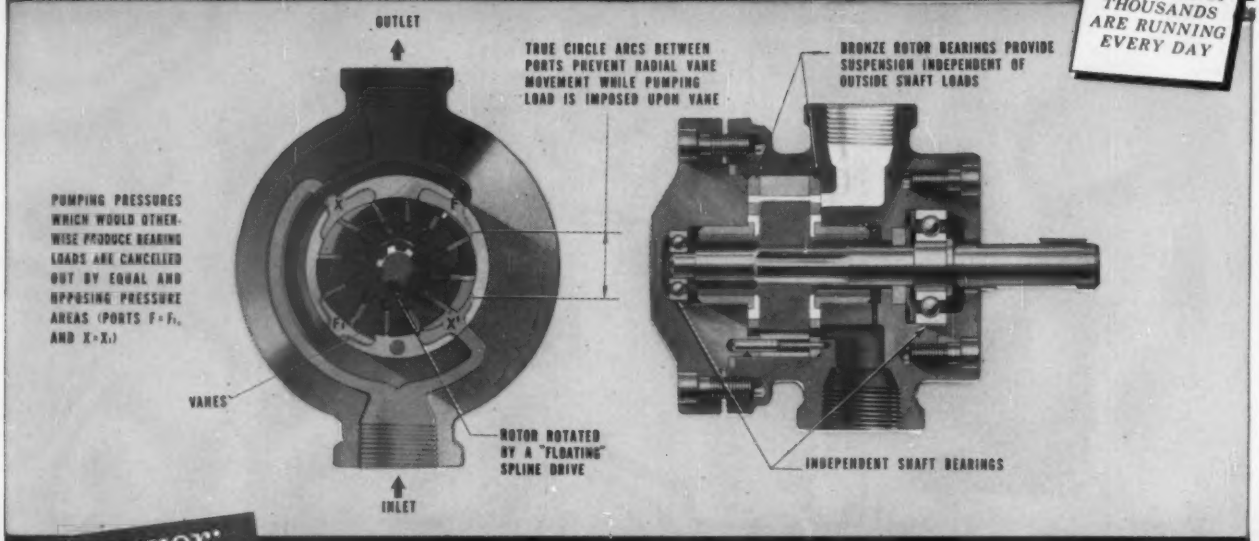
Write for Catalog

MARVEL *Metal Cutting* SAWS
Better Machines-Better Blades

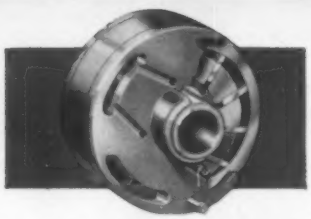
ARMSTRONG-BLUM MFG. CO. 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

Question:
Why are VICKERS Balanced Vane Type Pumps the most widely used oil hydraulic power pumps?

HUNDREDS OF THOUSANDS ARE RUNNING EVERY DAY


OUTLET
TRUE CIRCLE ARCS BETWEEN PORTS PREVENT RADIAL VANE MOVEMENT WHILE PUMPING LOAD IS IMPOSED UPON VANE
BRONZE ROTOR BEARINGS PROVIDE SUSPENSION INDEPENDENT OF OUTSIDE SHAFT LOADS
PUMPING PRESSURES WHICH WOULD OTHERWISE PRODUCE BEARING LOADS ARE CANCELLED OUT BY EQUAL AND OPPOSING PRESSURE AREAS (PORTS F-F1 AND X-X1)
VANES
ROTOR ROTATED BY A "FLOATING" SPLINE DRIVE
INDEPENDENT SHAFT BEARINGS
INLET

Answer:
Because of their SUPERIOR PERFORMANCE and MANY OTHER BENEFITS for the user.



For more than two decades, the Vickers Balanced Vane Type has held the leading position among hydraulic power pumps . . . growing steadily in popularity. The various models (see below) are *the most widely used of all pumps in oil hydraulic service.*

Above is the pumping cartridge which is one of this pump's distinctive features. The many advantages listed at the right merit the thoughtful attention of anyone concerned with the selection and use of oil hydraulic pumps.

VICKERS INCORPORATED

DIVISION OF SPERRY RAND CORPORATION

1410 OAKMAN BLVD. • DETROIT 32, MICH.

Application Engineering Offices • ATLANTA • CHICAGO AREA (Brookfield) • CINCINNATI • CLEVELAND • DETROIT HOUSTON • LOS ANGELES AREA (El Segundo) • MINNEAPOLIS NEW YORK AREA (Summit, N. J.) • PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • ROCHESTER ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE ST. LOUIS • TULSA • WASHINGTON • WORCESTER
IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto

COMPLETE HYDRAULIC BALANCE—Each inlet and outlet port is balanced by another equal in size and radially opposite . . . pressure-induced bearing loads are thus eliminated. Pressure-balanced porting plates maintain ideal running clearances.

FLOATING SPLINE DRIVE—Rotor is driven by a "floating" spline. Rotor and shaft have separate bearings . . . avoiding strain from drive misalignment.

TRUE-CIRCLE CAM ARCS between ports prevent radial vane movement while pumping load is imposed upon vanes. Wear between vanes and rotor is thus practically eliminated.

ABILITY TO TOLERATE DIRT—Clean oil is of great importance in a hydraulic circuit; but, in spite of care, dirt sometimes gets in. The Vickers Vane Type Pump will pass a reasonable amount of dirt without trouble and without grinding it up.

REPLACEABLE CARTRIDGE—Cartridge (illustrated above left) contains all pumping parts that move . . . none contact the housing. Working parts can be removed and inspected without disconnecting piping or drive coupling. Replacement cartridge kits are available and pumps need not be sent to the factory for repairs. Pump capacity can be changed by simply changing cartridge in the field.

HIGHER EFFICIENCY—Tests prove exceptionally high volumetric and overall efficiency . . . not only when pump is new but also after long service.

AUTOMATIC WEAR COMPENSATION—Vanes are held in contact with the cam ring by centrifugal force and hydraulic pressure. If wear occurs, vanes revolve in a slightly larger orbit without appreciable change in performance.

MINIMUM MAINTENANCE—Hydraulic balance . . . floating spline drive . . . independent bearings . . . automatic wear compensation eliminate the most important causes for maintenance and repair.

TEMPERATURE ADAPTABILITY—Correct running clearances are automatically maintained which compensate for wide variation in oil viscosity resulting from temperature variation.

LONGER LIFE—The numerous features mentioned above that keep down maintenance also contribute to longer life. Then, a new cartridge completely rejuvenates the pump.

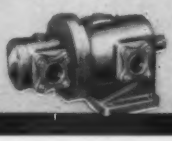
CONSTRUCTION SIMPLICITY is evident from the illustrations above. This simplicity is another reason for the superiority of Vickers Vane Pumps. For further information, ask for Bulletin 5002A.

7182

ALL MODELS HAVE THE VICKERS ADVANTAGES MENTIONED ABOVE

Single Stage. Pressures to 1,000 psi. Capacities to 55 gpm.

Two Stage. Pressures to 2,000 psi. Capacities to 55 gpm.



Double Pump—Two pumps for separate circuits driven by common shaft.

Two-Pressure Pump automatically delivers larger volume at low pressure and smaller volume at high pressure.

standard for comparison

...and with high speed steels the standard is REX

Living up to a standard for comparison isn't easy. That's why Crucible lavishes special care on the manufacture of REX® high speed steels... to keep REX the *standard* wherever high speed steels are used—as it has been for over half a century.

It's easy to *prove* the superiority of REX. Use it on the job... check its size, structure, response to heat treatment, fine tool performance. You'll agree with thousands of other users—*you can't find a high speed steel to outperform REX.*

Remember, REX is made only by Crucible. So call for REX at any Crucible warehouse, or for quick mill delivery. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

~~FRS~~

~~RLO~~

JF

AEL

Make your first stop at the Machine Tool Show the Avey booth. Just down the hall from Registration. They're full of stories on production drilling, milling, tapping. GWD tells me their rate of return is what we're looking for. That's Booth 316.

JJ

milling, drilling, tapping machine yields

93.4% the first 9 months

Avey

Can you afford to ignore an investment that returns 100% in less than a year? It doesn't seem likely, yet many plant operators hold down milling, drilling, and tapping operations to the capacity of standard machines.

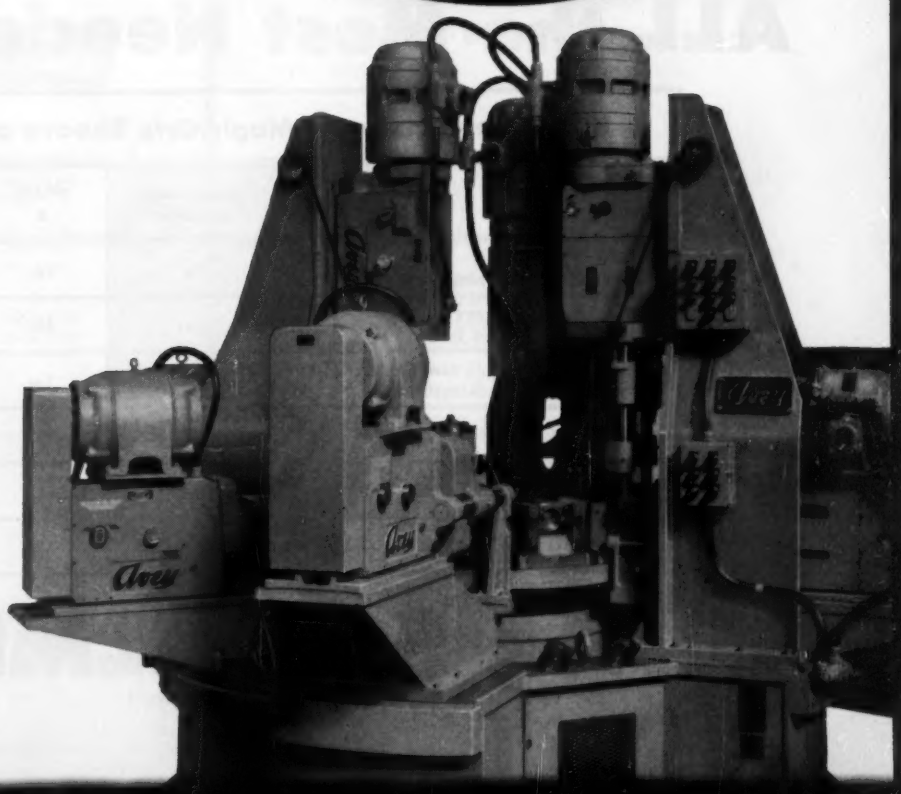
In contrast, the owner of this Avey production machine made high returns on this cast iron pump body (it may be similar to yours): 1 operator instead of 6; floor space cut from 600 to 180 sq. ft.; time per part from 5 minutes to 42 seconds. Put these figures in profit-and-loss terms and you see why the Avey machine pays off so fast.

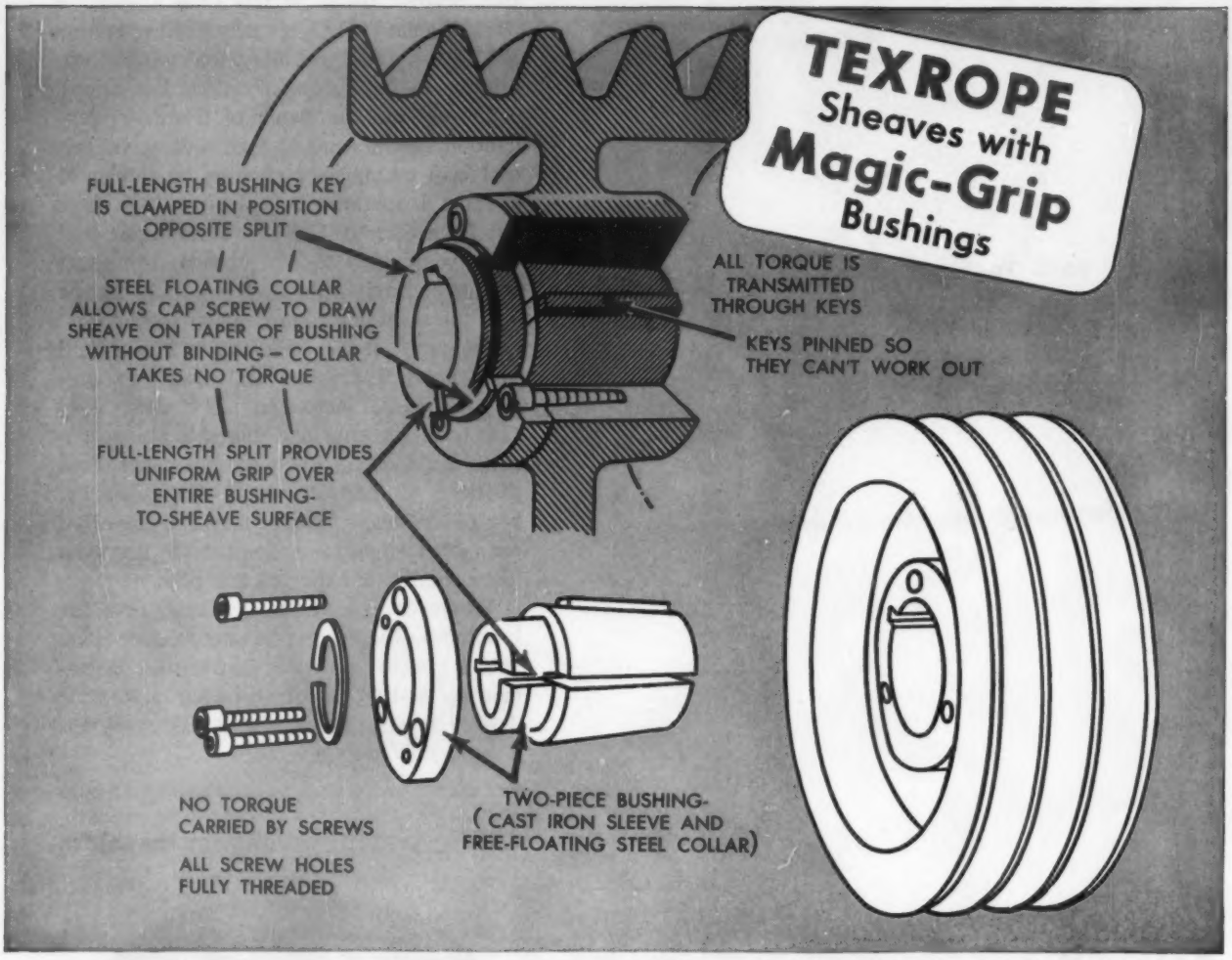
The machine has 10 Avey No. 2 Cam Feed units, a standard ribbed steel base, and standard automatic index table. Fixtures: rigid cam type. All units and the table are electrically interlocked; J.I.C. control panel. Production: 85 parts/hr. at 100% efficiency. ▶ *This machine has now been re-engineered for a different part*—so economically that even higher gains are expected this year.

Whatever your cash situation, new tax laws and Avey's pay-as-you-produce plan enable you to make this fast-earning investment now. Send a print of your part, state desired production rate, and ask Avey for a *profit prediction.*◀

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines




TEXROPE
Sheaves with
Magic-Grip
Bushings
FULL-LENGTH BUSHING KEY IS CLAMPED IN POSITION OPPOSITE SPLIT
STEEL FLOATING COLLAR ALLOWS CAP SCREW TO DRAW SHEAVE ON TAPER OF BUSHING WITHOUT BINDING – COLLAR TAKES NO TORQUE
FULL-LENGTH SPLIT PROVIDES UNIFORM GRIP OVER ENTIRE BUSHING-TO-SHEAVE SURFACE
ALL TORQUE IS TRANSMITTED THROUGH KEYS
KEYS PINNED SO THEY CAN'T WORK OUT
NO TORQUE CARRIED BY SCREWS
ALL SCREW HOLES FULLY THREADED
TWO-PIECE BUSHING- (CAST IRON SLEEVE AND FREE-FLOATING STEEL COLLAR)

Get the Only Sheave with ALL the Most Needed Features

Here's Comparison of *Magic-Grip* Sheave and Other Sheaves

	Magic-Grip Sheaves	SHEAVE A	SHEAVE B	SHEAVE C
Bushing fully split for uniform clamping action.	Yes	Yes	No	Yes
Load carried by keys instead of threaded bolts.	Yes	No	No	No
Bushings cover full range of NEMA "probable" shaft diameters.	Yes	Yes	Yes	No
All screws engage full thread.	Yes	Yes	Yes	No
Mounts in one piece.	Yes	No	Yes	Yes
Squares itself with shaft.	Yes	No	No	No

A-4167

Texrope and *Magic-Grip* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

MILWAUKEE 1, WISCONSIN

carbides?

IMPELLER HUB — 4" diam., 1¼" long, from SAE 1146 annealed steel forging. JOB ANALYSIS determined multiple-spindle chuckers with ALL CARBIDE tooling.

11 operations on first side, on 6" Acme-Gridley 8-spindle chucker with double indexing and duplicate tooling. 2 pieces per cycle in 22½ seconds machine time — 320 pieces per hour.

17 operations on other side on single indexing 6" Acme-Gridley 8-spindle chucker. 26 seconds machine time — 138 pieces per hour.

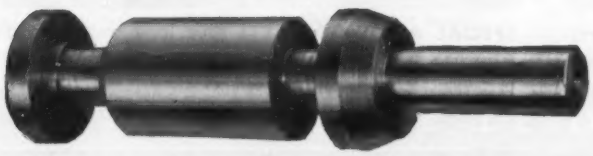
high speed?

SEAL RING — ½" thick, from 2½" diam. steel 6150 annealed. JOB ANALYSIS classed this as single-spindle job with HSS tooling.

5 shoulders rough and finish-formed to .002 tolerance, seat diam. held to .0005 tolerance, on 3½" single-spindle Acme-Gridley bar-type turret lathe. 7 minutes machine time — 8 (plus) pieces per hour.

Spindle speed automatically changed 4 times during cycle to provide suitable speeds and feeds for required finish.

or BOTH?



SHAFT — 7¾" long, from 1⅞" diam. steel 6250 annealed. JOB ANALYSIS indicated single-spindle bar-type turret lathe, with part CARBIDE and part HSS tooling.

10 operations including deep forming, turning and form-turning on 3½" single-spindle Acme-Gridley bar-type turret lathe: 5 minutes 46 seconds machine time — 9 (plus) pieces per hour.

5 automatic changes of spindle speed during the cycle provided speeds and feeds best suited for using both HSS and Carbide tools.

let the economics of the job dictate the right tooling method

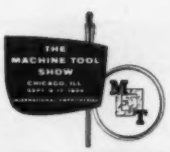
(And the Right Machine)

All Acme-Gridleys are built with a rigidity factor to withstand the pressure of any cutting tool yet devised—at speeds as fast as modern cutting tools can "take it." With such a margin of power, speed and stamina built into each of National Acme's COMPLETE LINE of multiple- and single-spindle bar and chuck-type automatics, you can safely let the *economics* of the job dictate:

1. **The best tooling method.**
2. **The machine best suited to produce the job most economically.**

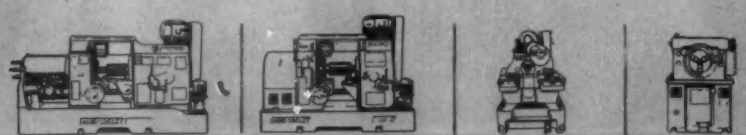
And you can be equally sure that tooling recommendations from National Acme will be based upon sound, experienced judgement.

If you would like a complete job analysis, we'd be glad to give you the benefit of our experience.

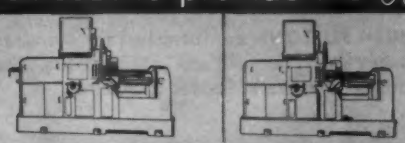


BOOTHS 324 AND 705

You can see National Acme's **COMPLETE LINE IN ACTION** at the Machine Tool Show. Study these modern machines. Ask questions. Then you'll learn why Acme-Gridleys are your best investment — for greater productivity today, and to maintain "new-machine-productivity" longer.



OUR JOB: to provide the *Right Machine* for **YOUR JOB**

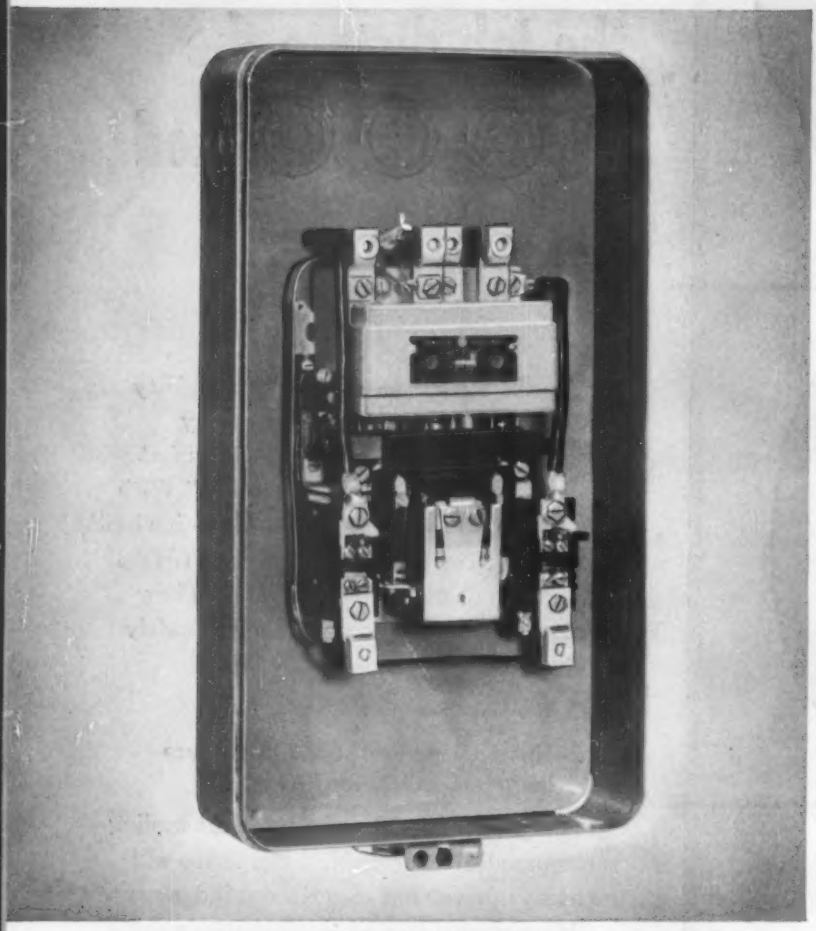


Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing.

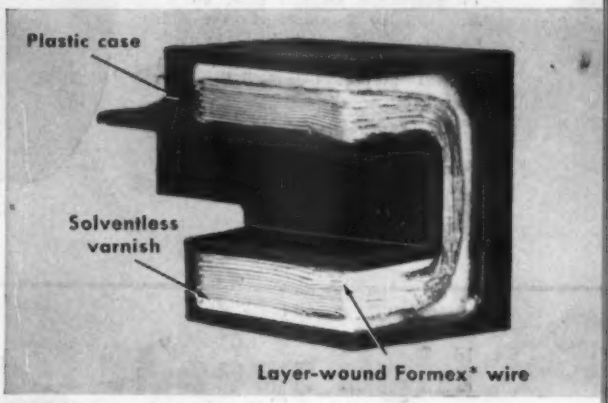
THE NATIONAL ACME COMPANY

171 EAST 131st STREET • CLEVELAND 8, OHIO

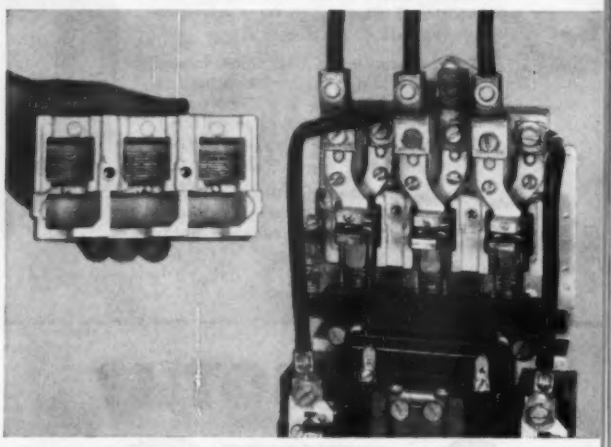
NEW G-E SIZE 4 STARTER



NEW SIZE 4 STARTER is designed for full-voltage starting of squirrel-cage motors. Bi-metallic overload relays may be easily changed from manual to automatic reset without removing from case.

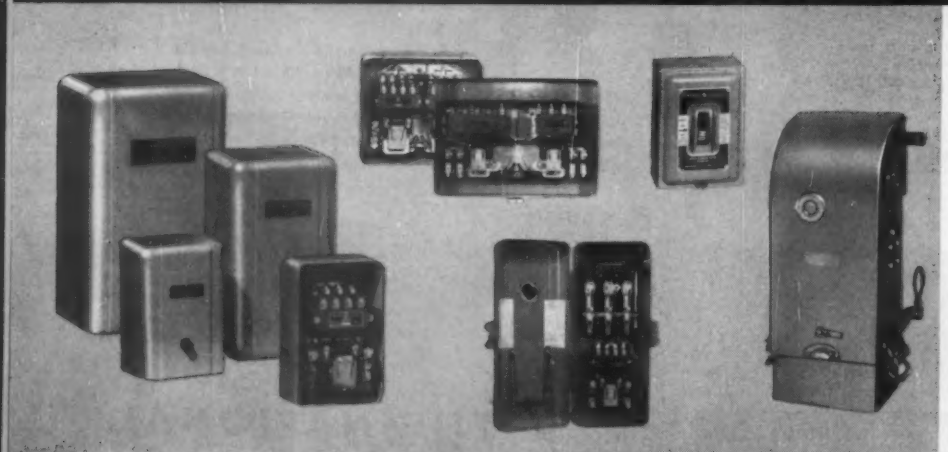


STRONGBOX MAGNET COIL is enclosed in a tough molded plastic case. Coil has firmly anchored terminals and is protected against dirt, oil and moisture.

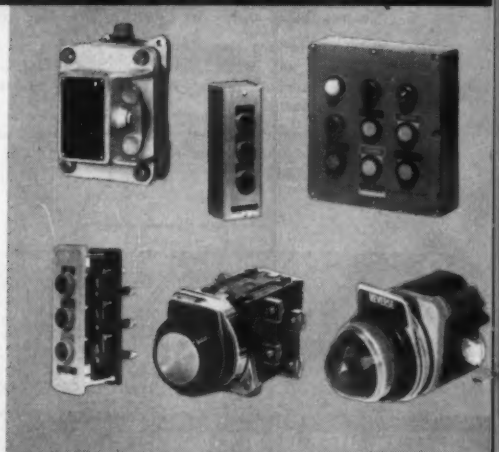


SPECIAL ALLOY CONTACTS give long weld-free life. Arcs are quickly extinguished by new blow-out design of contacts and cooling action of grids.

CHOOSE FROM THE COMPLETE LINE

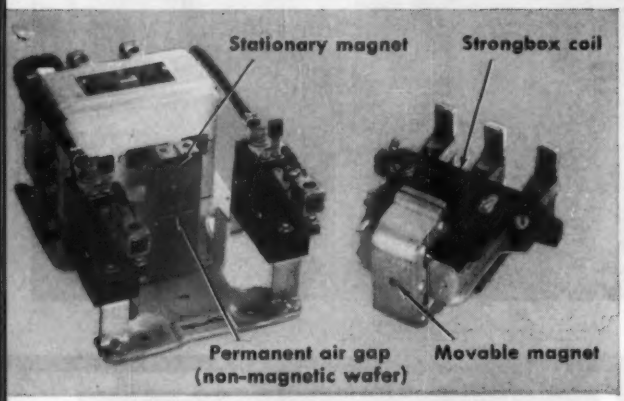


THOUSANDS OF STARTERS are available. They include: combination, reversing, multispeed, and manual and magnetic starters for full- or reduced-voltage starting. Starters are available in all popular NEMA and special enclosures.

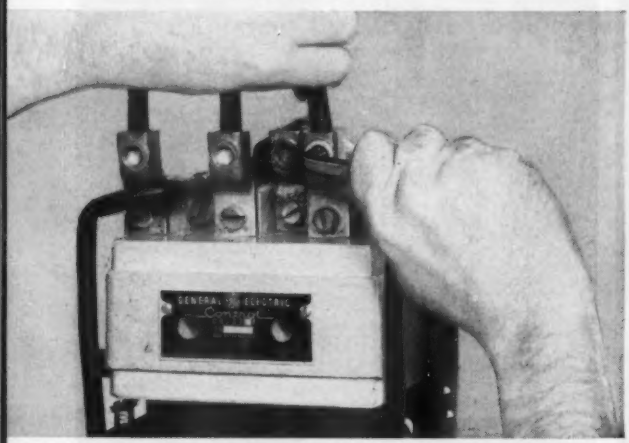


PUSH BUTTONS are furnished for standard, heavy-duty, or oiltight applications. Stations come in all NEMA enclosures.

FOR 25- TO 100-HP MOTORS



PERMANENT AIR GAP, away from striking surfaces, can't wear down and cause starter to "stick-in." Magnet design prevents contact chatter.



FRONT WIRED AND MOUNTED, new starter has solderless, pressure-type terminals for wires from AWG No. 6 to 250,000 c.m. 3-point front mounting is easy.

New magnetic starter for squirrel-cage motors

General Electric now adds a new, compact, NEMA Size 4 starter to its complete line of magnetic starters. The new starter offers many customer-proved features of size 0 to 3 G-E magnetic starters, such as the strongbox coil and the permanent air gap.

INSTALLED FROM THE FRONT, the new starter has 3-point mounting, and is completely accessible from the front when mounted. Right up in front are the solderless, pressure-type terminals for easy wiring. Also, 3 electrical interlocks, in any combination, can be installed from the front without removing the arc chute or movable-contact assembly. A vertical or horizontal mechanical interlock is also available for reversing and multispeed controllers.

MAINTENANCE IS EASY, and a screwdriver is the only tool required. Contacts are readily changed, and both coil and contacts are removable from the front without disturbing power wiring.

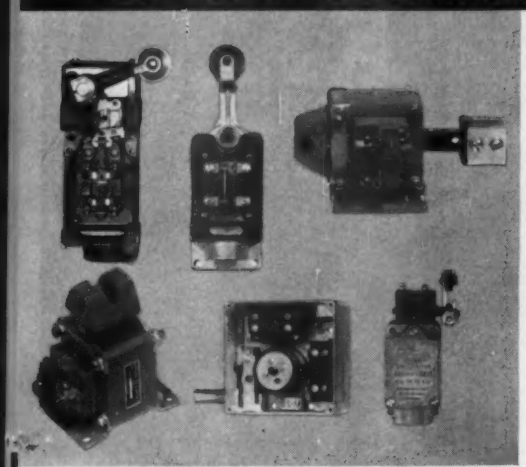
FOR MORE INFORMATION, contact your nearest G-E Apparatus Sales Office or Distributor, or mail in the coupon below. Ask for Bulletin GEA-6322.

**Reg. Trade-mark General Electric Co.*

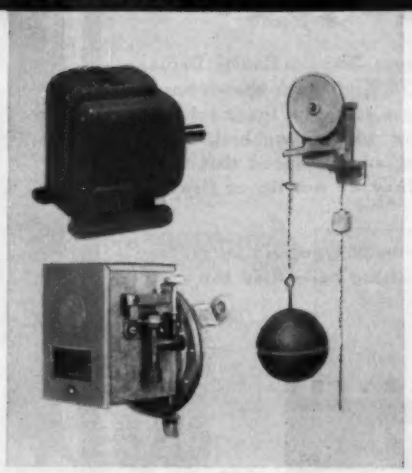
Progress Is Our Most Important Product

GENERAL ELECTRIC

OF G-E CONTROL DEVICES



LIMIT SWITCHES AND SOLENOIDS include lever and cam type limit switches, and the new strongbox solenoid.



G.E.'s LINE OF SWITCHES include pressure, vacuum, float, plugging and anti-plugging, pilot and reversing switches.

FREE NEW CATALOG of G-E General Purpose Controls.

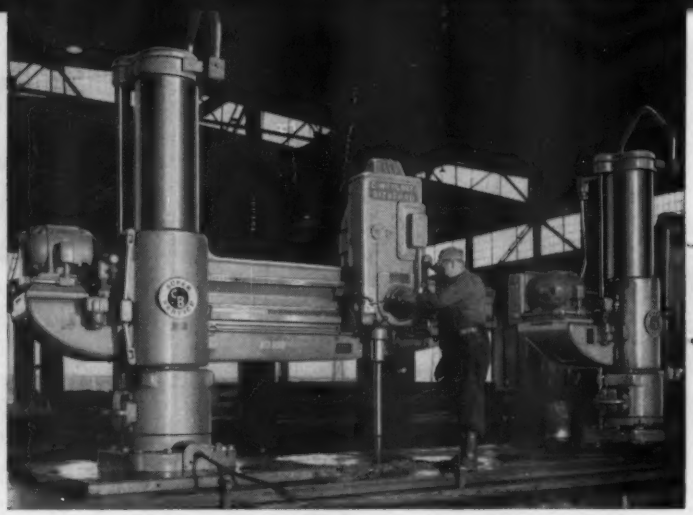
Advertising and Sales Promotion Sect. H 734-2
General Purpose Control Department
General Electric Company
Bloomington, Illinois

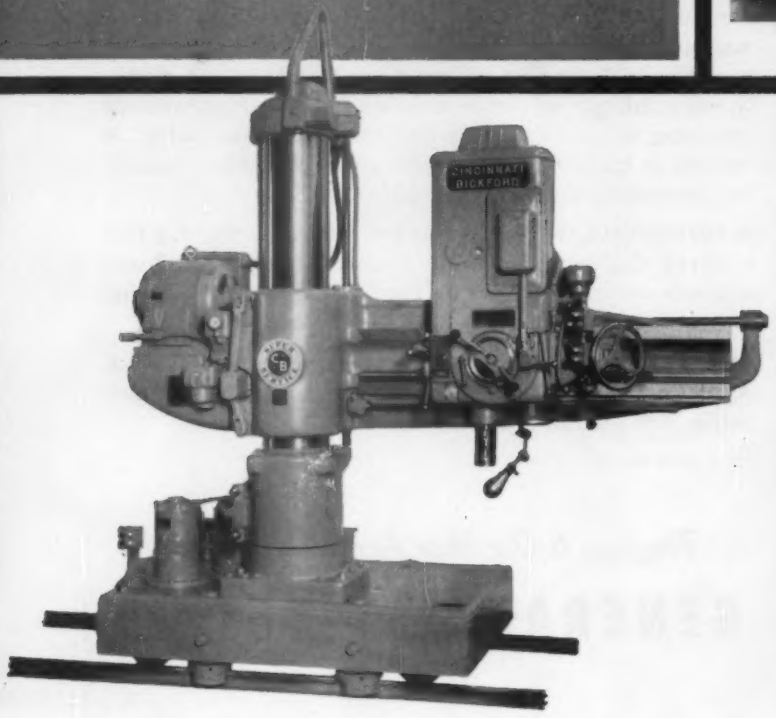
Please send a free copy of:

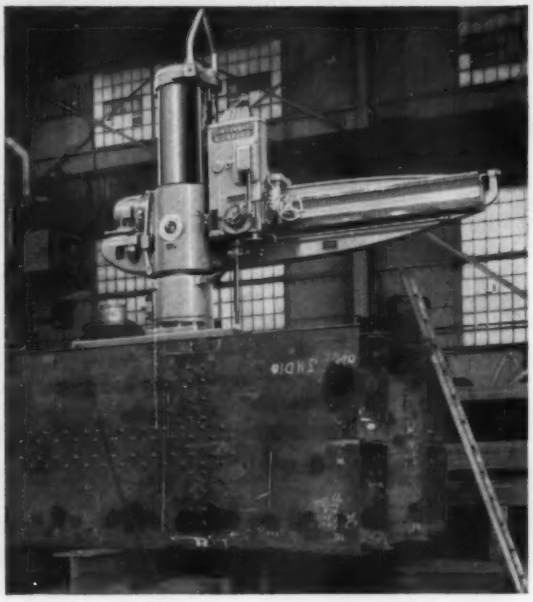
☐ GEC-1260A New Control Catalog
☐ GEA-6322 New Size 4 Starter
☐ For reference ☐ For immediate project

Name.....
Title.....
Company.....
Address.....
City.....State.....

MOVES that save you money





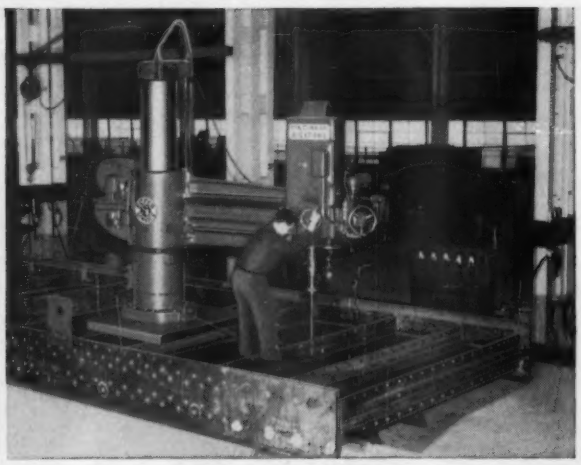


...on the large job!

These portable Cincinnati Bickford Super Service Radial Drills are effecting very large savings, up to 75% on work shown here. It is faster, more accurate and costs less to move the machine, instead of moving the work. Equipped with lifting bail, these machines are so perfectly proportioned and balanced that they need no clamping to work or floor. They do not tip or rise up while drilling.

Inquire about these portable machines—track type, sliding saddle on bed, or merely with stub base and lifting bail—they can save time and dollars for you.

Write for Bulletin R-29.



80 YEARS OF SERVICE

CINCINNATI
BICKFORD

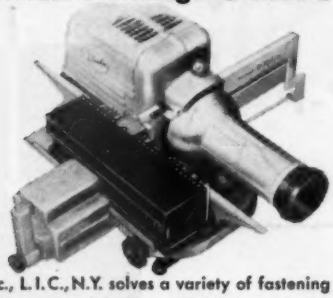
RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

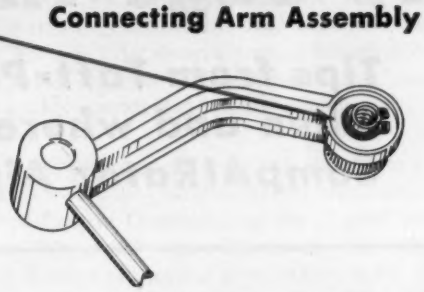
Waldes Truarc Rings Permit Better and More Economical Design—Fewer Parts, Faster Assembly, Minimal Rejects!

Viewlex's Change-O-Matic



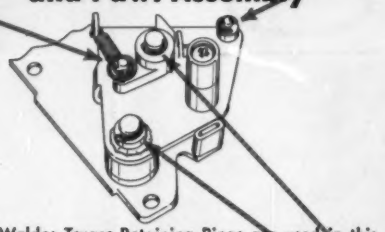
Viewlex, Inc., L.I.C., N.Y. solves a variety of fastening problems in their new model Change-O-Matic automatic slide changer. Assembly time is speeded, parts eliminated, rejects lowered, and compact, economical product design achieved.

Connecting Arm Assembly



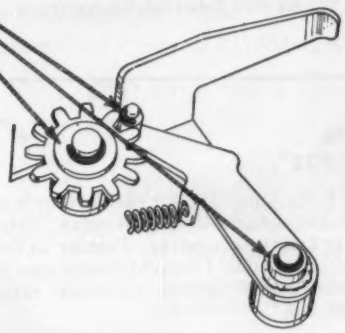
Use of one Waldes Truarc Ring (Series 5100) eliminates time-consuming riveting over the flange, retains and holds the connecting knob captive. A compact, neat design is made possible, rejects caused by poor riveting eliminated.

Actuating Plate and Pawl Assembly



Three types of Waldes Truarc Retaining Rings are used in this assembly. One circular self-locking ring (Series 5105) retains pawl return spring. One external E-ring (Series 5133) retains roller used to prevent gear motion during transport cycle. One crescent ring (Series 5103) retains pawl which indexes gear. Second crescent ring retains sub-assembly. Truarc Rings speed assembly, cut rejects, eliminate parts.

Detent Lever Assembly



Truarc E-ring (Series 5133) eliminates use of tapped hole and shoulder screw, retains roller which prevents over-travel of gear. Assembly is rapid.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product... to save you material, machining and labor costs. They're quick and easy to assemble and disassemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring.

36 functionally different types... as many as 97 different sizes within a type... 5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U. S. A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today... let our Truarc engineers help you solve design, assembly and production problems... without obligation.

For precision internal grooving and undercutting... Waldes Truarc Grooving Tool!

Send for new catalog supplement

WALDES

TRUARC®

RETAINING RINGS

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
(Please print)

Name.....

Title.....

Company.....

Business Address.....

City..... *Zone*.... *State*.....

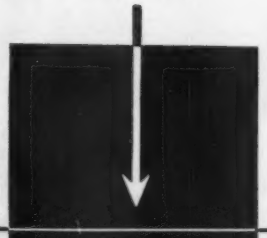
AM097

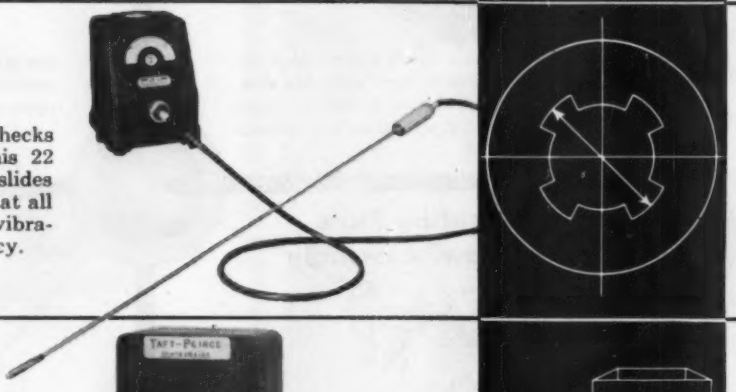
WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.

NUMBER THREE IN A SERIES

What's The Best Way To Gage These Parts ?

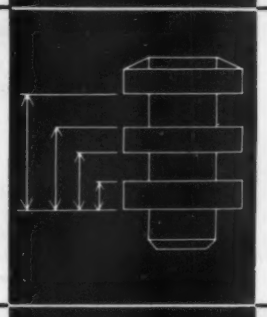
Tips from Taft-Peirce on when and where to use a T-P CompAIRator Air Gage





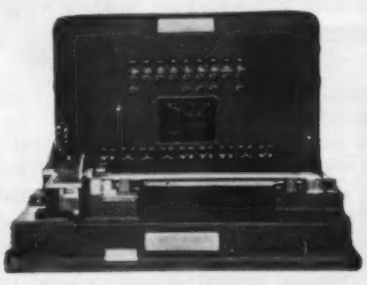
Helical Groove Diameter Tolerance: .002″

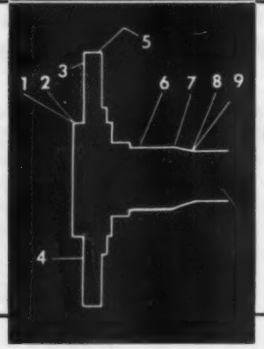
A single dial T-P CompAIRator Air Gage checks the helical rifling groove diameters in this 22 caliber rifle bore 32″ long. Gaging member slides in and out of bore, checks groove diameter at all points. Extremely sensitive yet sturdy — vibration, jarring, tilting won't disturb its accuracy.



Four Heights Tolerance: .002″

One four dial T-P CompAIRator checks four land heights simultaneously on this spool valve. Tilted line-type dials facilitate reading. Pointer action is positive, instantaneous. CompAIRators can be designed to check any specific tolerance range from .0001″ to .125″.





OD, Squareness, Runout, Concentricity Tolerances: from .0005″ to .003″

This T-P CompAIRator combines air-electric, standard air, and computing air circuits to check 5 diameters, 2 runouts, one flatness, and one concentricity simultaneously on auto rear axles. Lights indicate dimensions out of tolerance. Exclusive T-P Computing CompAIRator circuits figure runout, flatness and concentricity. Eliminate usual four measurements and computations.

For more examples and the complete story on Taft-Peirce CompAIRator Air Gages send for Bulletin.

WHAT IS A COMPAIRATOR AIR GAGE?

A CompAIRator is a sensitive gaging instrument that measures variations in the velocity of tiny jets of air. When work is placed over these jets, air flow is restricted and its velocity reduced. Any change in air velocity reflects a change in part size, which is immediately shown on a calibrated indicator. Since only air contacts the part in most cases, there is minimum wear on gaging members. Fast, accurate, dependable, a T-P CompAIRator is simple to operate, requires little or no maintenance.

STANDARD AND SPECIAL COMPAIRATORS | COMPUTING COMPAIRATORS | AUTOMATIC SORTING MACHINE | AIR ELECTRIC COMPAIRATORS

T-P means Top Precision

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

Leading a Dog's Life...?

ARE YOU IN THE DOG HOUSE BECAUSE OF GRINDING WHEEL PROBLEMS? Then switch to CINCINNATI (PD) WHEELS. For *now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that can *save you money . . . and increase your production.*

Here's how CINCINNATI (PD) WHEELS can put a twinkle in your eyes and a smile on your face: through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS are priced no higher than ordinary wheels.

So, let us help you get out of the dog house and lead a normal life again. Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

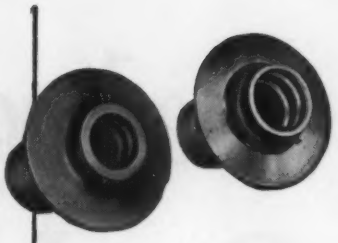
Remember—*only* CINCINNATI Grinding Wheels give you...

(PD) POSITIVE DUPLICATION.

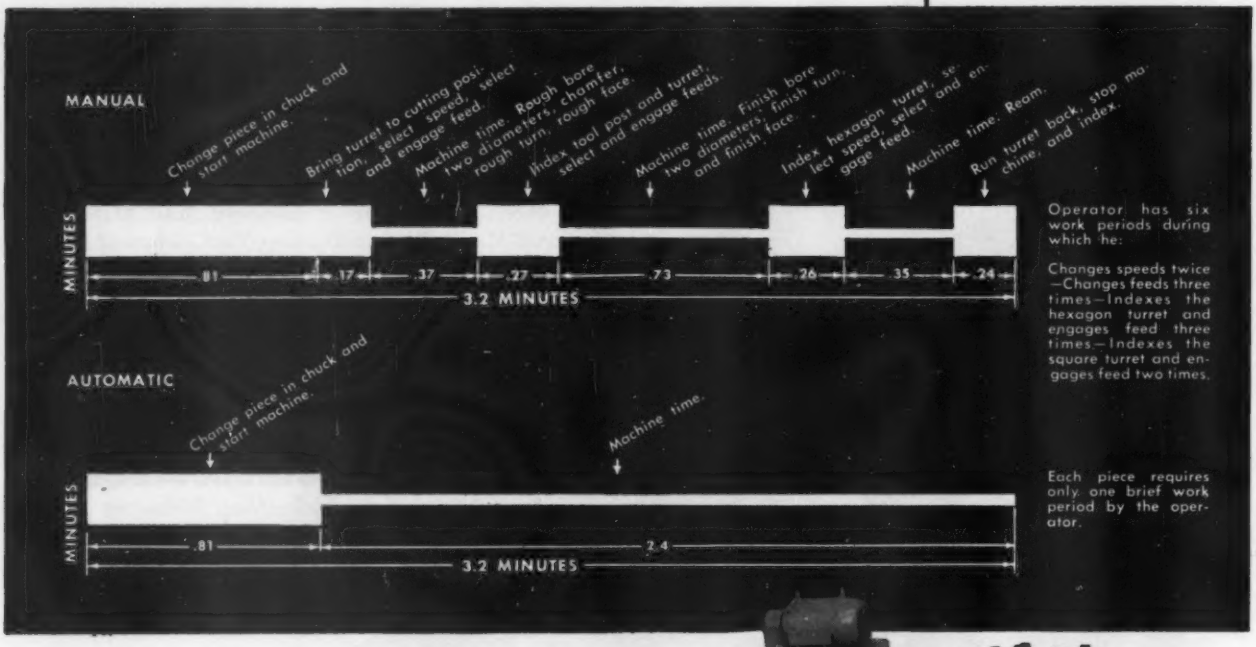
CINCINNATI
Grinding Wheels

A PRODUCTION-PROVED PRODUCT OF
THE CINCINNATI MILLING MACHINE CO.

how the GISHOLT FASTERMATIC saves man-minutes and money!



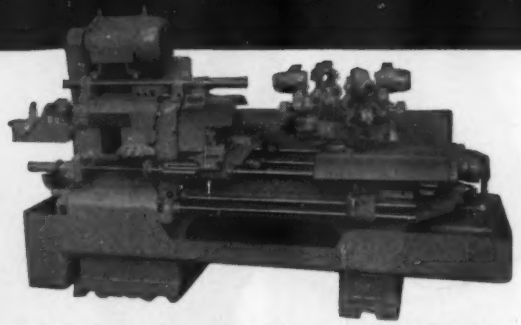
Here is an actual comparison of the time and work cycle of a manually operated turret lathe and a Gisholt Fastermatic Automatic Turret Lathe. The machining of wheel hubs, shown above, requires 6 operations as follows: rough bore, finish bore, ream, rough face, finish face and chamfer. Note that the manually operated machine takes over 54% of the operator's time whereas the Fastermatic takes only 25% of his time, leaving 75% without interruption.


MANUAL
Change piece in chuck and start machine.
Bring turret to cutting position, select speed, select and engage feed.
Machine time. Rough bore two diameters, chamfer, rough turn, rough face.
Index tool post and turret, select and engage feeds.
Machine time. Finish bore two diameters, finish turn, and finish face.
Index hexagon turret, select speed, select and engage feed.
Machine time. Ream.
Run turret back, stop machine, and index.
MINUTES
.81
.17
.37
.27
.73
.26
.35
.24
3.2 MINUTES
Operator has six work periods during which he:
Changes speeds twice —Changes feeds three times—Indexes the hexagon turret and engages feed three times—Indexes the square turret and engages feed two times.
AUTOMATIC
Change piece in chuck and start machine.
Machine time.
MINUTES
.81
2.4
3.2 MINUTES
Each piece requires only one brief work period by the operator.

That's the story of the Fastermatic in a nutshell—less work time for the operator. The Fastermatic handles all changes of feeds and speeds automatically.

In this case, for example, the other side of the work piece is done by another Fastermatic with substantially the same cycle. One operator keeps both machines constantly under cut and still has ample time for stacking and work inspection. Important, too, is the fact that both Fastermatics are tended by a comparatively unskilled operator.

There are many such cases where Fastermatics can cut costs substantially. Gisholt engineers will gladly answer your questions. Write us.



THE GISHOLT 1-F FASTERMATIC—*smallest of 3 different sizes which enable you to machine a maximum number of surfaces in one chucking, handling all changes in speed and feed automatically. On this job, turret was double-tooled so that two parts were completed with each revolution of the turret. Ask for literature.*

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

Whatever kind of gears you make...
Whatever way you make them

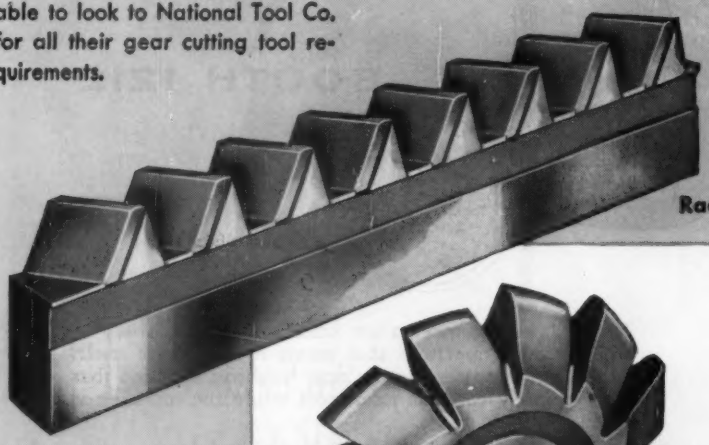
National Tool Co.

can supply the right type cutting tool
because we make *all* types

National Tool Co., with 50 years experience in the manufacture of special cutting tools, makes *all* varieties of gear cutting tools for *all* types of spur, helical and worm gears—as well as for sprockets and splines. Whatever your gear requirements—large or small—National engineers can help you decide the most efficient method of producing them. Many gear manufacturers have found it profitable to look to National Tool Co. for all their gear cutting tool requirements.

Gear Shaving Cutters

Hobs



Rack Type Gear Shaper Cutters

Gear Shaper Cutters

Involute Gear Cutters

Master Gears

Herringbone Gear Cutters

1905 • 1955
Our 50th Year

National
TOOL CO.
Cleveland 2, Ohio

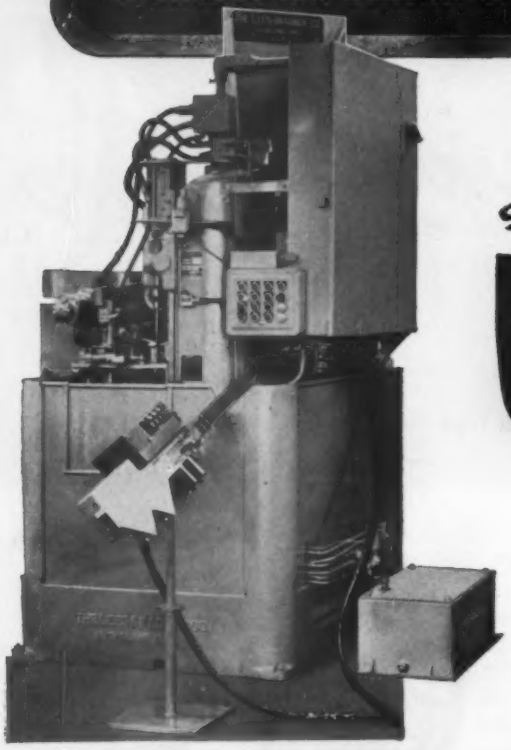
Representatives in major industrial centers

GET THE PITCH ON ...

MACHINES THAT THINK FOR THEMSELVES

AUTOMOTION

ENGINEERED AND DESIGNED BY THE LEES-BRADNER CO. CLEVELAND 11, OHIO



SEE IT IN ACTION AT

THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

BOOTH 1212

TYPICAL PERFORMANCE DATA

3½" diameter, 3 start hob	Hobs two gears every 4 minutes
Runs at 200 RPM	47 teeth in gears
Feeds at .050" per revolution	Face width of gear ¾"
Hobs two pieces per load	Loading and unloading time 2 seconds

Here is your chance to see Automotion in action . The amazing machine that seems to think for itself. Lees-Bradner presents the gear hobbing machine that electronically corrects tolerances while the machine is in operation.

The "Electronic Brain" checks the finished gears as they come from the hobber and makes corrections in pitch diameters or root fillets by shifting the hob between cycles.

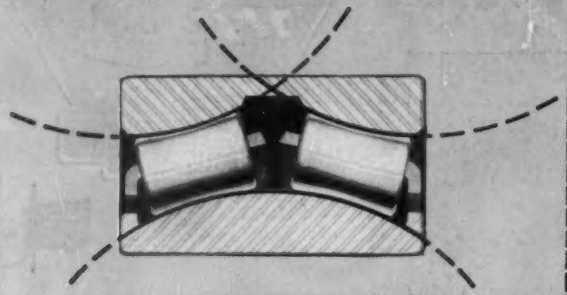
This revolutionary hobber is the reason we say "get the pitch on Automotion". . . the ultimate in efficient, time-saving hobbing.

Don't forget—Booth 1212 at the Machine Tool Show. Or, contact your Lees-Bradner representative who has the "pitch" on Automotion.

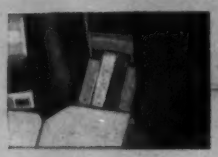
the LEES-BRADNER Company

CLEVELAND 11, OHIO • U.S.A.

These important
bearing differences
may spell longer machine life for you



FREE ROLLING—SELF-ALIGNING. Inner ring is truly spherical, free to align in any direction without altering contact area with rollers. Full load capacity is always assured despite shaft deflection or misalignment.

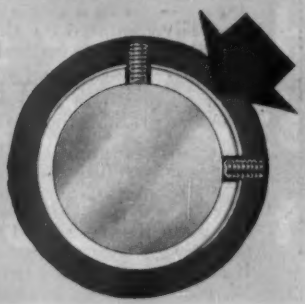


Buna N and Felt Seal for extremely dirty conditions.

Labyrinth Seal for normal conditions.

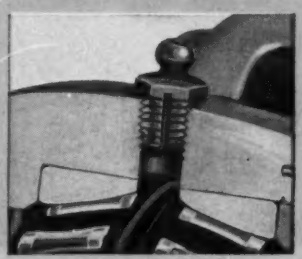
EFFECTIVE SEALING. Buna N and Felt or Labyrinth Seals (see above cut-aways) keep grease in and dirt out.

COLLAR SECURELY LOCKS INNER RING TO SHAFT. Tendency for collar to assume original circular shape reacts against threads of set-screws to maintain tightness. Use of set-screws in collar avoids distortion and possible breakage of inner ring.



Spring locking collar with two knurled cup-point set-screws hold bearing firmly in position.

EXCESSIVE GREASE PRESSURE PREVENTED. Lubrication fitting with pressure relief feature permits escape of excessive grease. Bearings are prelubricated and sealed at factory, ready for operation.



They're all present only in LINK-BELT roller bearings

BEARING inefficiency costs you more than replacement alone. The life of your machines is affected . . . capacity decreased . . . power wasted. That's why Link-Belt features unrestricted alignment of both ball and roller bearings. It compensates for shaft deflection or support distortion.

Every Link-Belt bearing offers advantageous *differences*—some big, some small, all important. Ask your Link-Belt office or authorized stock carrying distributor for Data Book 2550 covering this complete line of pillow blocks plus flange, flange-cartridge, cartridge, take-up and hanger blocks and self-aligning bearings.

Series 400 roller bearings are part of industry's most complete line of ball and roller bearing blocks.

13,712-A

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

LINK-BELT

Ball and Roller Bearings

Mill circles and angles in one set-up with

tri-D
MILLING HEAD
KEARNEY & TRECKER
MILWAUKEE

Pat. No. 2286821
Other Pat. Pend.

Booth No. 508

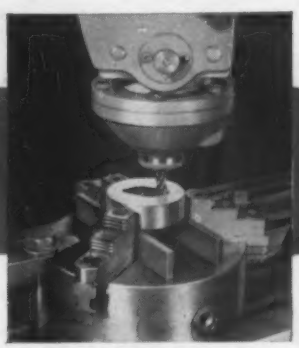
Here, operator uses TRI-D Milling Head to perform a variety of intricate milling operations on a workpiece—straight, circular, angular, radii—all in a single set-up. Angular adjustment of cutter in vertical plane is an exclusive feature of TRI-D.

For tool rooms, die shops or production milling — — do it faster, easier with new TRI-D attachment

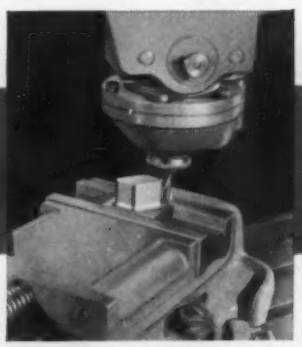
Kearney & Trecker's new TRI-D Milling Head — featuring rotary, lateral and angular adjustment in vertical plane — is ideally suited for rough and finish milling of various geometric shapes — straight lines, radii, circles, angles — all in a single set-up. It can be easily mounted on almost all horizontal and some vertical milling machines . . . *regardless of make.*

Illustrated here are some of the intricate operations the TRI-D performs.

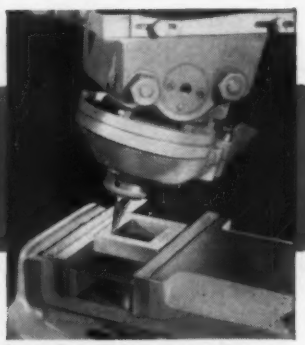
Learn what the TRI-D can do for you — how different it is from all other types of milling heads in use today. For "proof-positive" demonstration, see your Kearney & Trecker representative. Contact him today, or write Kearney & Trecker Corporation, 6784 W. National Ave., Milwaukee 14, Wis.



Die (left) and punch (right) are rough and finish milled in a single set-up, using all three basic movements of the TRI-D



and milling machine. Prescribed feeds and adjustment of TRI-D is all that's required to finish both workpieces.



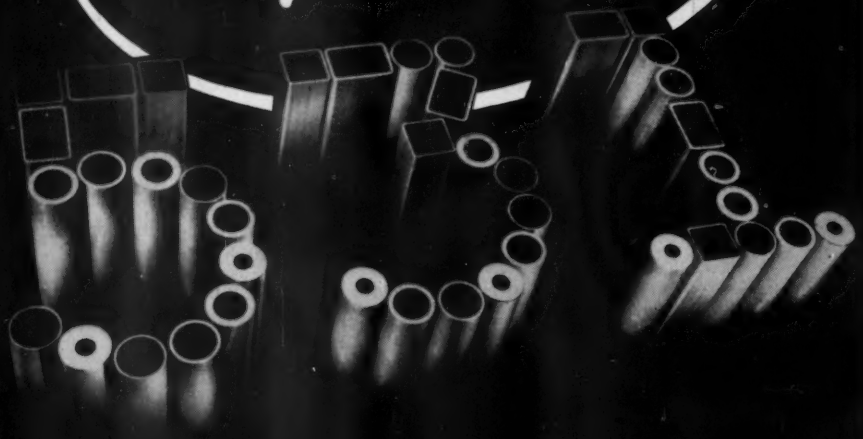
Angular setting of TRI-D, with an ordinary end-mill ground to a specific angle, is used to mill the "square corners."

Kearney & Trecker CORPORATION
KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Builders of Precision and Production Machine Tools Since 1898

For more information on Kearney & Trecker's new TRI-D Milling Head, write for catalog No. TD-10.

Mechanical Tubing?



Take your choice from 531 sizes— we have them all!

We are *really* stocked to serve your every tubing need . . . with dependable Shelby Seamless Mechanical Tubing in the standard 531 sizes for you to choose from! We can furnish your entire tubular requirements from either warehouse or mill.

Such wide selection offers you greatest freedom of design for it means that you can always get *exactly* what you want from us—and without delay. Then, too, on your warehouse requirements you save the time, money and space that would be required in keeping an adequate tubing inventory of your own.

When you want technical assistance, we can be of great help, too. Our staff has experience with problems similar to yours and can often recommend the proper analysis, condition or size of tubing for your needs.

May we serve *you?*

U. S. STEEL SUPPLY
DIVISION

General Offices
208 So. La Salle St., Chicago 4, Ill.

USS

Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

Call U. S. STEEL SUPPLY for ALL your steel needs...

- Structural Shapes
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USS STEEL — UNITED STATES STEEL

FREE BOOK ON TUBING

Here's an authoritative "text book" on mechanical tubing — "Shelby Seamless Steel Mechanical Tubing" —that you'll turn to again and again for reference. It's a handy 5" x 7" size, 115 pages and fully indexed. Includes tolerances, machining allowances, physical properties and other important data. Send the coupon for your *free* copy.

U.S. Steel Supply Division
Dept. 295, 208 So. La Salle St., Chicago 4, Illinois
Gentlemen:
Please send me, without charge, the Shelby Mechanical Tubing Book.

Name .....

Company .....

Address .....

Is there such a thing as...

A PRACTICAL REPLACEMENT PROGRAM?

YES! — and Jones & Lamson can help you develop it

Industry unanimously endorses the idea of planned replacement of capital equipment. Nevertheless, most of America's machine tools are more than 10 years old, sadly inferior to today's profit-producing equipment. The idea is sound — but action is lacking.

Biggest reason for this paradox is financial. Until recently, replacement required a substantial outlay of capital. In many cases, needed capital was lacking; in others, the capital, though available, had many other calls upon it. Unrealistically low depreciation allowances on capital equipment served as an added deterrent to replacement.

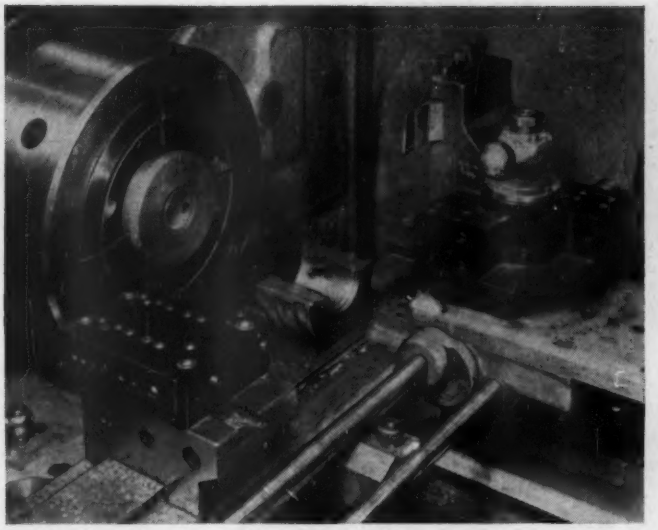
The picture has changed. Now, provisions of our new tax laws permit more equitable write-offs, and make replacement a more attractive proposition.

Jones & Lamson makes replacement even *more* feasible, by clearing away the traditional difficulties of financing with its unique Procurement Plans.

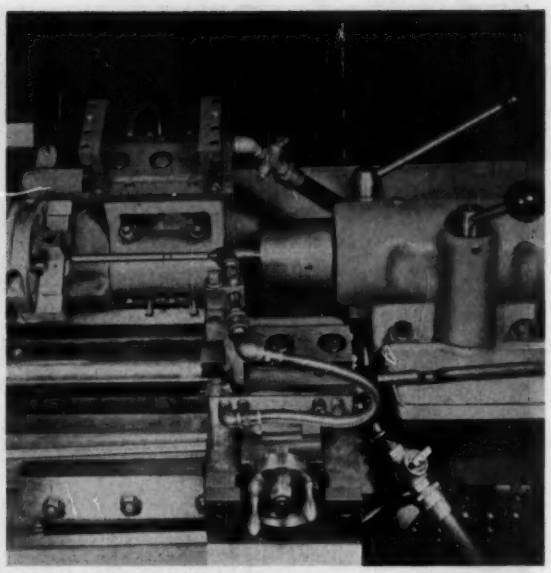
This, then, is what Jones & Lamson offers: modern machine tools that can greatly improve your production; *plus* your choice of several sound, low-cost (interest rates of 3¼%, and lower, add-on) methods of procuring these tools.

◀ **OBSOLETE** machine tools like these hamper industrial growth, keep production low, and costs high.

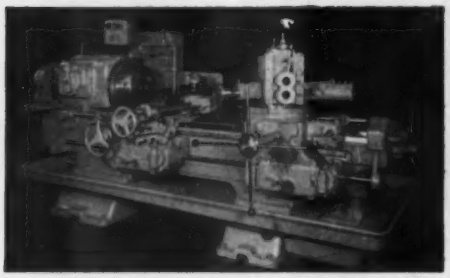
RESEARCH in machining methods, metallurgy, tool geometry, is carried on continually by J & L. Important findings have resulted in the incorporation of unique engineering features in J & L machines.



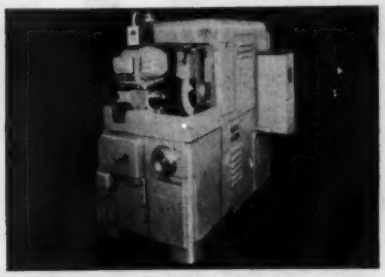
IMPROVED production on this difficult machining job was made possible by J & L engineers' close co-operation with the customer. Research testing, and incorporation of special features on a J & L turret lathe cut time-per-piece on this bottle neck-ring from 14 to 5½ min., increased production 120%!



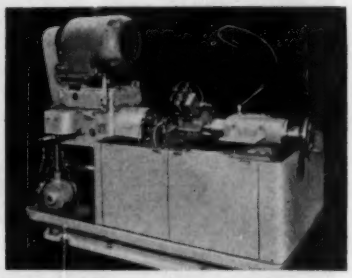
AUTOMATIC OPERATION. One Fay Automatic Lathe replaced eight engine lathes formerly used on this job — and substantially increased production of sewing machine crankshafts at the same time.



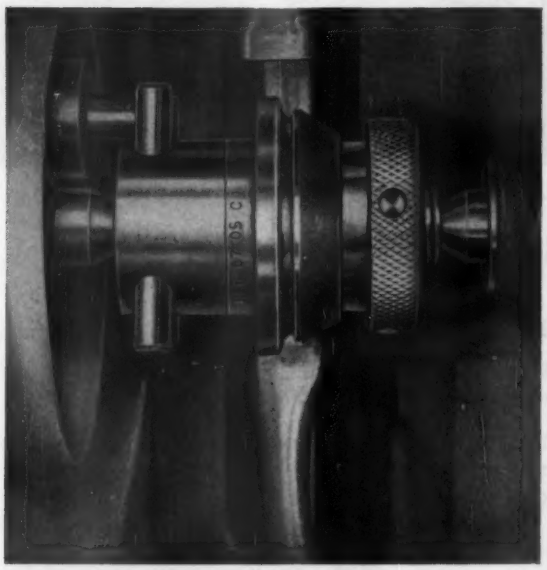
Universal Turret Lathes



Automatic Thread & Form Grinders



Fay Automatic Lathes



GRINDING. This J & L Model "E" Form Grinder, used in producing seaming rolls for the canning industry, completely eliminated a roughing operation, increased production by 100%.

JONES & LAMSON

MACHINE J&L COMPANY

502 Clinton St., Springfield, Vt., U. S. A.

Universal Turret Lathes • Fay Automatic Lathes • Automatic Thread & Form Grinders
Optical Comparators • Automatic Opening Threading Dies & Chasers
Automatic Double-End Milling & Centering Machines

Send today for complete details on J & L's machines, methods and Procurement Plans. Simply fill in the coupon below, clip it to your letterhead *and mail. We'll do the rest.*

JONES & LAMSON MACHINE COMPANY
502 Clinton St., Springfield, Vt., U. S. A.

GENTLEMEN:
Please send me the J & L Machine Tool Replacement Information Kit.

Name.....

Title.....

Benjamin, Oscar and Ralph Lazrus, brothers who head the Benrus Watch Company, ask . . .

"Have you seen the Benrus torpedo?"

"Within its perforated shell, three of our self-winding waterproof watches were towed from Gibraltar to New York, submerged in the turbulent wake of a fast trans-Atlantic liner. When the torpedo was opened – every watch was on time to the tick!

"Then came the job of delivering 56,000 more of those same Benrus watches to jewelers all over the country, before the nationwide TV promotion date.

"We called Air Express—and every watch arrived on time.

"We depend on Air Express. They handled over 11,000 shipments for us last year. Not one was lost, late or damaged.

"Yet Air Express usually costs us less than would any other complete air service. 15 lbs., for instance, from New York to Atlanta, Ga., is $5.63. That's the lowest rate in the field by $1.27. Add it up on several thousand shipments!"

Air Express

GETS THERE FIRST *via U.S. Scheduled Airlines*

CALL AIR EXPRESS . . . *division of* RAILWAY EXPRESS AGENCY

No. 4 in a series

CONE WITH UP STEP

You send print to Cone

Cone makes recommendations

Cone submits samples of your work

You get demonstration of your work and complete job development record

No "automatic" user can afford to be out of touch with the latest developments in the use of carbide tools.

The popularity of the Conomatic Carbide Development program has made necessary larger quarters for increased clientele accommodation.

This innovational Cone service is without obligation of machine purchase and is available to users of any brand of multiple spindle automatic.

It costs nothing to know just how profitable your work might be with modern machines, tools, and know-how.

DATA FOR COMPARISON

Part.....Spec. Cap Screw	Length.....4 17/32" Cutoff 2" Thread
Machine.....1⅝" Conomatic	
Tools.....100% Carbide Tipped	RPM.....885 Work Spdl. 580 Th'd Spdl. 1465 Total Eff'd.
Material.....8742	
Stock Size.....1" Across Flats	Time.....14 Secs.

Conomatic

Send for particulars on "Four Steps With Cone"

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

WHAT	WHERE	WHY
SUNVIS 900	**In tight systems** where oil is rarely changed and little or no make-up is needed.	**Exceptionally long life** of oil keeps overall costs low.
SOLNUS	**In tight systems** where make-up oil is less than 5% per month.	**Moderately priced**...excellent stability and rust protection.
SUNTAC	**In leaky systems** where make-up average is 5% or over per month.	**Reduced leakage** in systems cuts oil costs and downtime.
CIRCO	**In systems** where oil is continuously diluted by water, cutting fluids and other contaminants.	**Low-priced**...excellent protection where oil must be changed frequently.
SUNVIS H.D. 700	**In systems contaminated** by dust and deposits of sludge, varnish, etc.	**Cleansing action** removes deposits and eliminates costly teardowns.
LUBEWAY	**In dual purpose systems** of machine tools where hydraulic oil is also a way lubricant.	**Added film strength** of this hydraulic oil also eliminates "stick-slip" on ways.

CHART SHOWS WHERE AND WHY SUN HYDRAULIC OILS SAVE MONEY

As the chart shows, to operate your hydraulic system at maximum efficiency and minimum cost you must consider the condition of your hydraulic system, as well as pressures, operating temperatures and other usual factors.

And, very important, you must consider the age of your system. Continued use of original oil recommendations can be costly. A change in the type of oil can often result in substantial savings...especially where systems have developed leaks or where sludge and varnish cause excessive maintenance.

For complete information about how Sun hydraulic oils can help you cut operating costs of your hydraulic system, see your Sun representative...or write SUN OIL COMPANY, Philadelphia 3, Pa. Dept. AM-9.

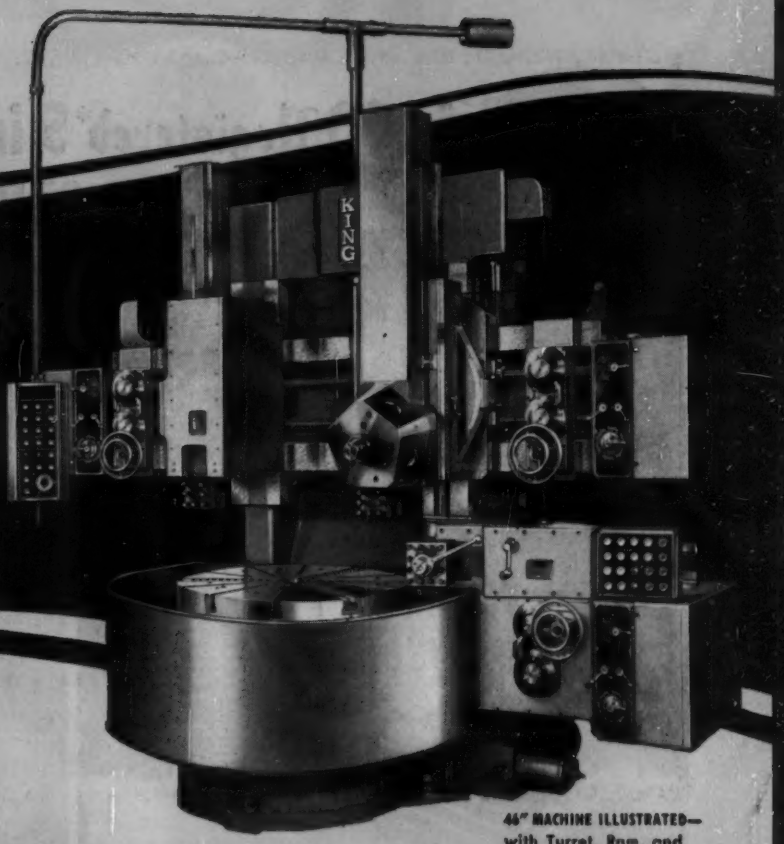
SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

Sets
NEW PRODUCTION STANDARDS for
Vertical Boring
and Turning Work...



46" MACHINE ILLUSTRATED—
with Turret, Ram, and
Side Head

—

Wide variety of head
combinations available

the All New KING

These new King® machines — *completely redesigned* — will bring to boring mill users the *greatest productive capacity ever achieved for vertical boring and turning work!*

Greater horsepower; increased speeds and feeds; simplified controls; many power-operated devices—will *increase your productivity.*

Advanced engineering of mountings for spindle and for all heads and turrets—substantially increased machine rigidity —will give you *greater-than-ever accuracy.*

With maximum use of *unit* construction and many components redesigned to reduce wear, you'll have a minimum of machine maintenance and downtime.

For full details on new model King machines send for new Catalog K-5 covering 30", 36", and 46" sizes. (Catalogs on larger sizes will be available later.) Write to us direct or to the King distributor in your area.

Here are a few of the many advanced KING features....

- 40 to 50 H.P. on 30" to 46" sizes.
- 75 to 100 H.P. on sizes 56" and up.
- 24 feeds available.
- Feed selection from direct-reading dial.
- 24 speeds in geometric progression in any of three standard ranges.
- Pendant-located control of:
  - pre-selective speeds from direct reading dial.
  - speed change.
  - head movements in either feed or rapid traverse.
  - power swiveling of rail heads at rapid traverse or feed rate.
  - power indexing of rail head turret and side head tool block (optional).
- Automatic lubrication of all moving parts.

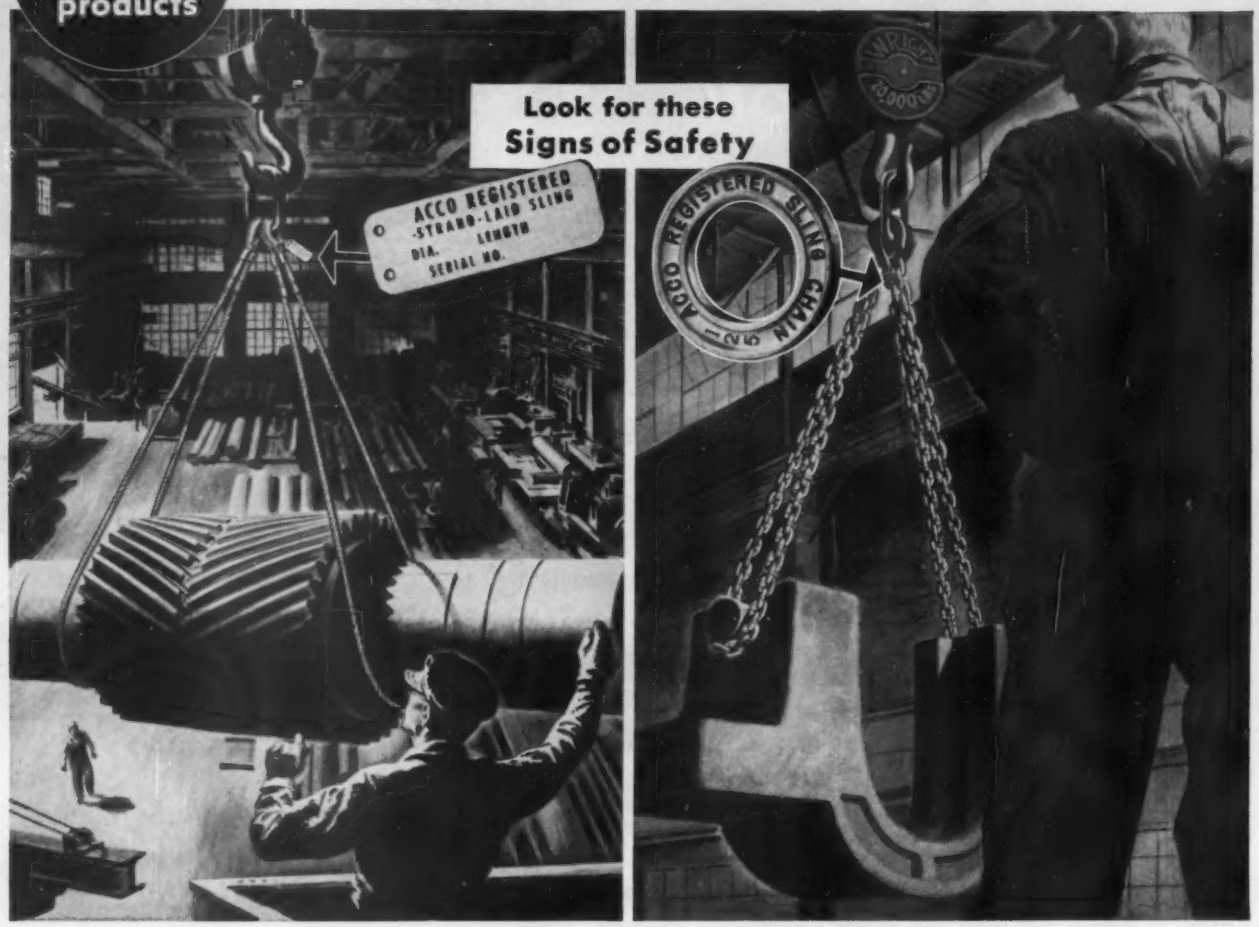
AMERICAN STEEL FOUNDRIES, KING MACHINE TOOL DIVISION
1150 Tennessee Ave., Cincinnati 29, Ohio

KING Vertical Boring and Turning Machines

ACCO products

ACCO Registered* Slings–Wire Rope & Chain

THE STANDARD OF EFFICIENCY AND SAFETY



SAFETY WITH A SAVING

• Materials Handling is one of the most costly production operations, yet insurance of uninterrupted flow of materials is necessary for efficient and economical production. Regardless of how well production is planned, a dropped load can be very costly even without involvement of personal injury. Time is consumed, machining operations already completed can be rendered valueless, and, if a major machine tool is involved, the whole line is shut down.

ACCO *Registered** Slings are materials handling tools specifically designed to require less hook-up time and through their proved safety actually protect *against* production interruptions. All this is money saved and safety gained.

ACCO *Registered* Safety Is More Than Skin Deep

Before any item can be used in an ACCO *Registered** Sling it must prove to be the safest, most-efficient available for its particular use. Then it must prove under actual test to have strength equal to, or higher than, that developed by sling body.

For example, the special ACCO Hooks used in these slings are forged, heat-treated to insure standardized strength, proof-tested, inspected, and magna-fluxed. NOTHING IS LEFT TO CHANCE.

Components which have passed these tests are then assembled into completed ACCO *Registered** Slings according to designs which have proved their safety and efficiency in rigorous field tests. Next the completed sling is individually proof-tested to twice the working load limit. Then and only then can it be tagged "ACCO *Registered.*"

Compare the assurance given by this careful control of quality, strength, and design with the methods used in fabricating old fashioned, "home-made" slings.

*Trade Mark Registered

ACCO MAKES BOTH CHAIN AND WIRE ROPE SLINGS . . .

ACCO can supply both types of slings. As you know, there are places where one is preferable to the other. And there are places where a combination of both is called for. Whatever the set-up, ACCO Registered slings will fill the bill with greater safety. ACCO can advise you impartially, can furnish dependable printed information.*

Write or phone your ACCO Distributor. If you don't know him, get his name from the ACCO office in city nearest you.

ACCO

TRADE MARK

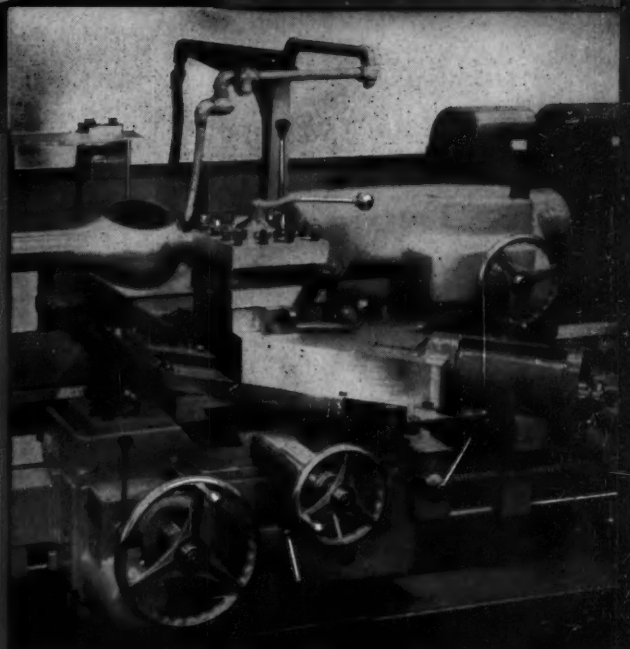
AMERICAN CHAIN & CABLE

BRIDGEPORT, CONN.

Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Wilkes-Barre, Pa., York, Pa.
In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

for Better Value

2 hrs. — versus 9½ hrs.



This marine Diesel engine connecting rod is now roughed and finished from the rough forging in exactly 2 hours. It formerly required 9½ hours to do the same job.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

More production per man hour is the answer and the only answer to prohibitive costs—modern, high production machinery is the answer to greater production per man hour.

The astounding saving on this connecting rod job is the result of transferring it from previous equipment to a new 32-inch "AMERICAN" Hydraulic Duplicating Lathe. Such savings as this are not the exception but the rule when "AMERICAN" Duplicators are put on the job.

Bulletin No. 35 shows many such examples—it's yours for the asking.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

Other coolants claim greater production...Johnson's Guarantees* it

Many claims are made for many coolants. But only TL-131, made by Johnson's Wax, backs all its 5 points of superiority with an iron-clad money-back guarantee. In other words, when you use TL-131, there's no risk . . . you can't lose.

Your guarantee of performance

We guarantee the superior performance of Johnson's TL-131 Coolant. The full purchase price will be refunded if TL-131 fails to meet the following conditions, in your plant, in actual production.

1. Provides increased tool life.
2. Provides greater production where increased feeds and speeds can be employed.
3. Ends foul coolant odors for two months.
4. Eliminates formation of undesirable deposits on machine tools.
5. Gains operator preference.

These five guaranteed advantages add up to extra profit possibilities in your shop. Johnson's Wax Lubricants and Coolants are carried in stock by a leading industrial supply house in your area. Contact your local Johnson distributor for an in-the-shop test or mail the coupon for full information.

Mail this coupon for FREE informative booklet of Johnson's Wax Coolants and Lubricants.

S. C. Johnson & Son, Inc.
Industrial Products Division, Dept. AM-9, Racine, Wis.

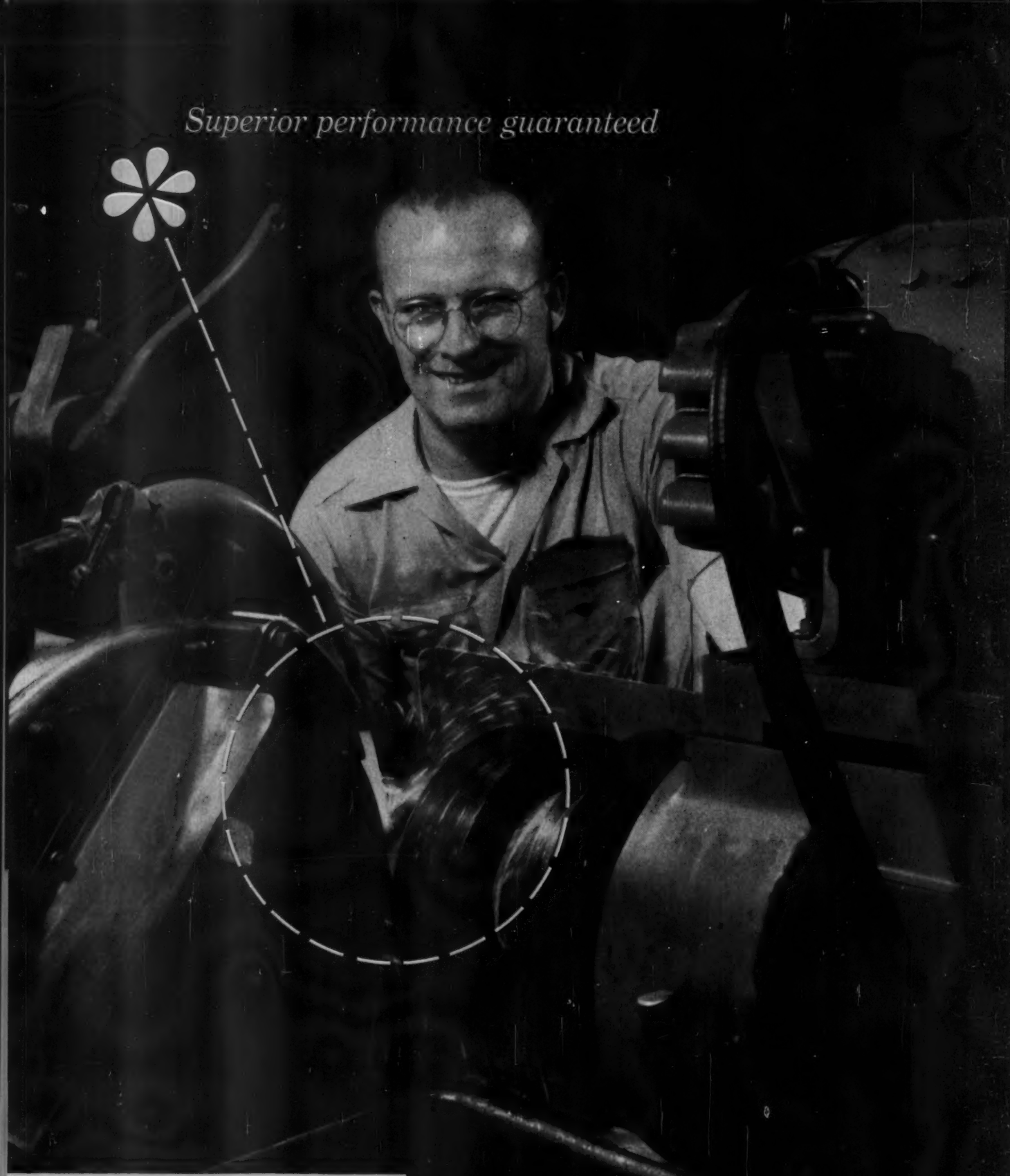
Name_____

Firm Name_____

Address_____

City_____ Zone_____ State_____

Superior performance guaranteed

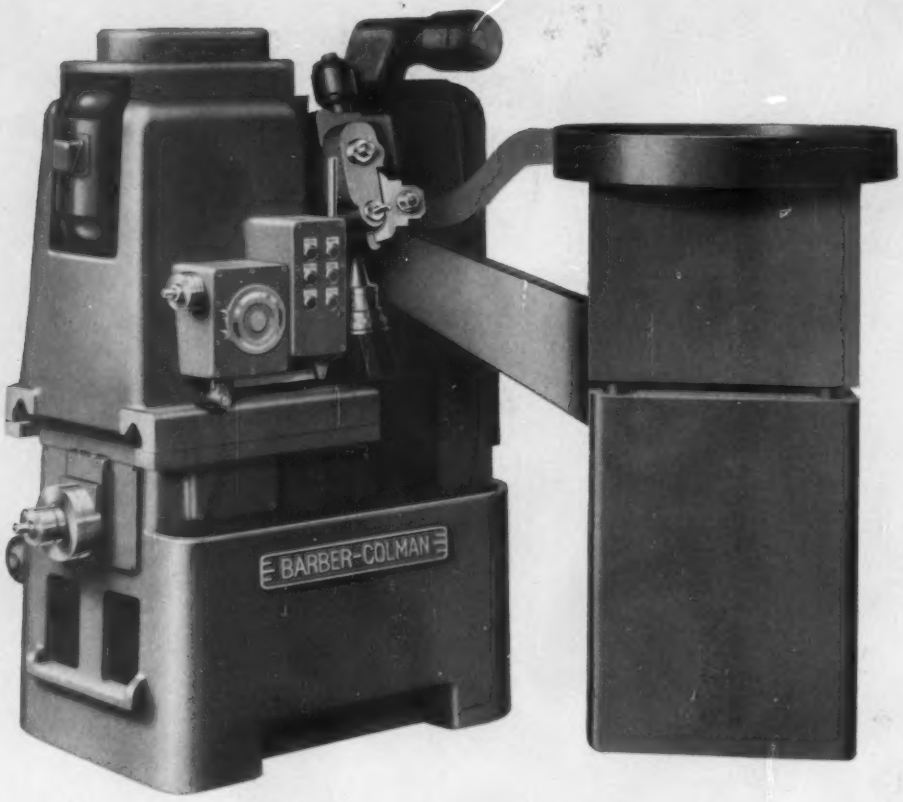


TL-131 is designed for fastest cooling . . .

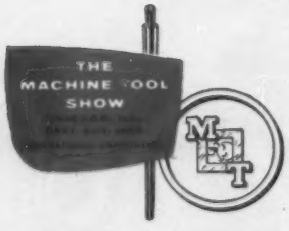
TL-131 is a completely new type of water soluble cutting fluid with unequalled cooling ability. Its special ingredients dissipate costly heat and supply essential lubrication to permit increased feeds and speeds impossible with conventional coolants.

City Zone State

a NEW automatic high-speed hobbing machine...



The Barber-Colman No. 3-6 Vertical Hobbing Machine is a single-purpose machine designed and built to meet the requirements of a specific job. The machine has standard basic elements, but the tooling, loading, gaging and handling are designed for maximum production of a specific part. Its high-speed operation makes it adaptable to all mass produced parts up to 3" diameter by 6" face width. Maximum pitch capacity is 10 DP. Hob speeds for carbide hobbing of non-ferrous and non-metallic blanks are available. Features which contribute to the high-speed operation of this machine include exceptionally large heat-treated and ground bed ways, short drives to the work and hob spindles, and a hardened and ground multiple-thread index worm.



In operation at the machine tool show . . . Booth No. 1322, Amphitheater

The No. 3-6 will be in production operation at our booth. Drop in and see it work. Get full information and literature there, with estimates for your jobs.

BUILDERS OF PRECISION GEAR

BARBER • COLMAN

No. 3-6

for high production gear cutting with automatic handling, loading and gaging

automatic loading	Blanks are automatically loaded from a vibratory hopper loading device. However, the type and variety of loading and handling devices with which this machine can be equipped are almost unlimited. Loading can be by magazine or conveyor when required.
automatic gaging	The gaging mechanism segregates gears of the correct size from those that are oversize or undersize. Size inspection is made by measuring over balls. If a pre-determined percentage of gears are out of tolerance, the machine can be made to stop automatically. The gaging unit can be furnished to inspect almost any elements of the gear.
automatic hob shifter	The automatic hob shifter can be set to shift a certain amount after each cycle, or it can be arranged to shift after a certain number of parts have been cut. Shifting increments can be changed easily by means of a graduated dial. The hob slide is clamped pneumatically.
centerdistance adjustment	The hob is set to the proper depth by means of a centerdistance adjusting mechanism, eliminating the usual time-consuming method of setting the hob to depth. The hob is placed in a fixture, and an indicator finger is set against the outside diameter. The indicator is calibrated to show the centerdistance between the work and the hob. This centerdistance setting is made by means of a graduated dial on the machine.

Some basic machine facts:

- Short, Compact Drives to Work and Hob Spindles
- Anti-Friction Work and Hob Spindle Bearings—Tapered Roller Type
- Pneumatic Work Clamping
- Self-Contained Lubrication and Coolant Supply
- Heat-Treated and Ground Bed V-Ways
- 2 HP, 1800 RPM Drive Motor
- Unitized Construction

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 619 ROCK STREET, ROCKFORD, ILL.

HOBS AND MACHINES SINCE 1911

ARMSTRONG

Use the Correct...

ARMSTRONG TOOL HOLDERS

to increase pieces, production and profits!

Because they do their work so well, without repairs, maintenance or replacement . . . because they last for years and have become as much a part of everyday operations as steel itself, the importance of using the correct type and size ARMSTRONG TOOL HOLDER for each operation, is frequently overlooked. It should always be remembered that by controlling the cutting point, ARMSTRONG TOOLS control both the productivity and efficiency of every lathe, planer, slotter, and shaper in most shops.

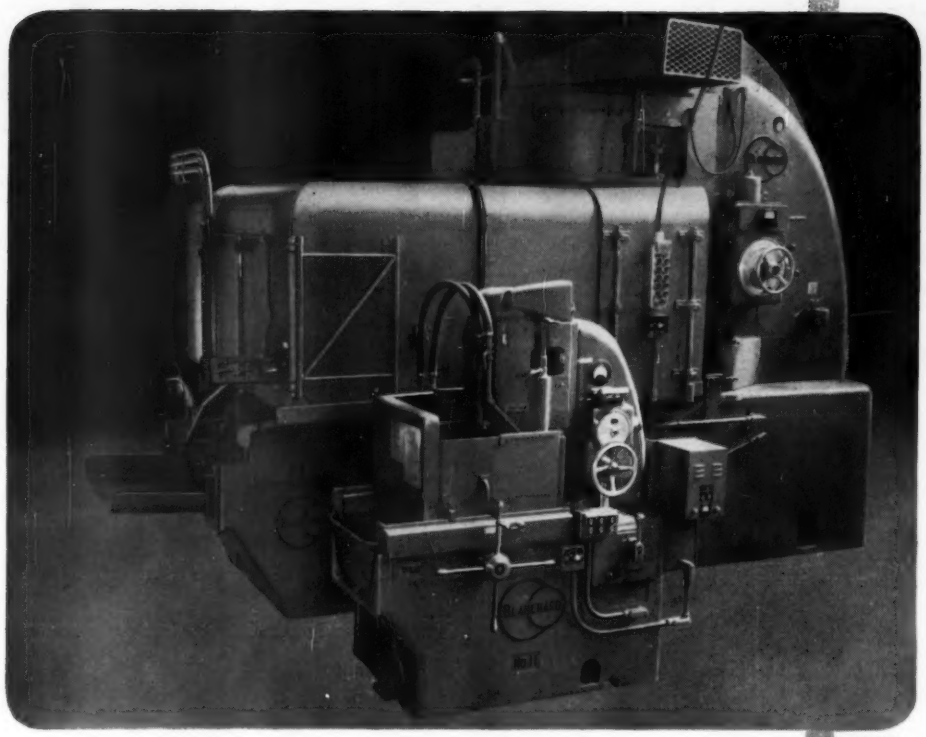
Tools so vitally situated, no matter how trouble-free, deserve periodic checking . . . checking to see that the correct size and correct type ARMSTRONG TOOL HOLDER is being used for each operation: checking to be sure that you are taking full advantage of the new additions to the Armstrong System—the special types for ARMIDE (Carbide Tipped) Cutters, others for ARMOLOY (Cast Alloy) Bits and Blades; the newer "spring" form threading tools and cutting-off. etc., etc.

Write for a recent ARMSTRONG Catalog and check your tooling of each operation.

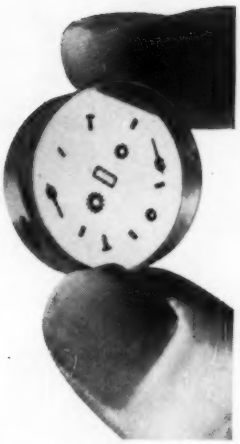
ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. ARMSTRONG AVE. **CHICAGO 30, ILL.**



V-488



Tiny watch gears, pinions and ruby bearings — flat and parallel — to a dimension tolerance of .0002″.

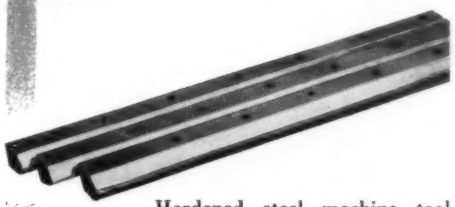
To 3 micro-inches and flat within *one* light band.

Please give us a chance!

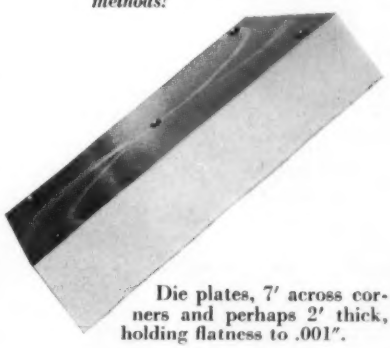
We *know* we can do *your* flat surface jobs. We've done them all — tiny watch parts . . . steel plates 7 feet across corners . . . copper and ceramics . . . *perfectly*. Just give us the correct wheel . . . (Blanchard wheels are preferable).

Blanchards regularly grind surfaces flat to within 2 to 4 light bands, parallel to less than .0001″, with dimension tolerance of .0002″ and surface finish to better than 3 micro-inches.

Honest, we Blanchards (15 models) work fast and inexpensively — whether the job requires precision grinding or rapid removal of stock. Give us a chance to prove we're the best investment you ever made.



Hardened steel machine tool ways, 2½″ x 3½″ x 50″, ground on 6 sides, flat within .001″ with surface finish of 5 micro-inches — *5 times faster than other methods!*



Die plates, 7′ across corners and perhaps 2′ thick, holding flatness to .001″.

VISIT BLANCHARD BOOTH NO. 406
AT THE MACHINE TOOL SHOW

Send for free copies of "Work Done on the Blanchard" (fourth edition), and "The Art of Blanchard Surface Grinding".

PUT IT ON THE **BLANCHARD**

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.**

EXTRA

When high production

you can count on . . . . . .

BULLARD

TYPE RD

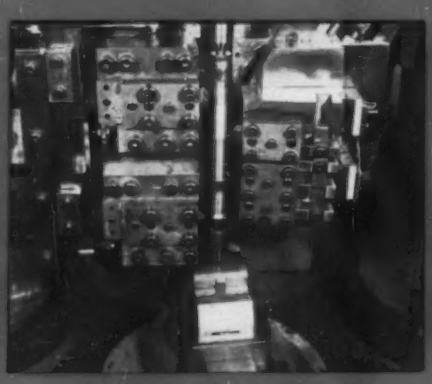
Contin-U-Matic

A multiple-spindle production chucking machine, The Bullard Contin-U-Matic, Type RD, is automatic and operates continuously through each cycle thereby eliminating indexing time.

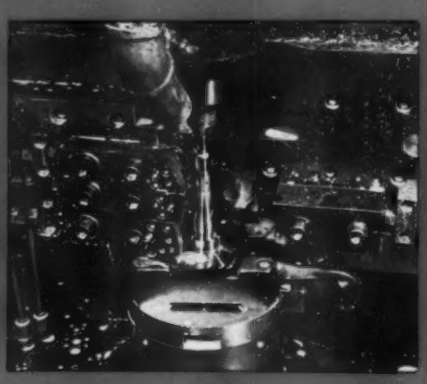
Specifications of Contin-U-Matics are generally made to suit the particular job for which the equipment is purchased but can be furnished in certain standard forms to cover given ranges of work where the operations may require some versatility.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

BRAKE DRUM



TRANSMISSION INPUT SHAFT



STEERING KNUCKLE

counts

SEVENTY FIFTH
1888 BULLARD 1963
ANNIVERSARY

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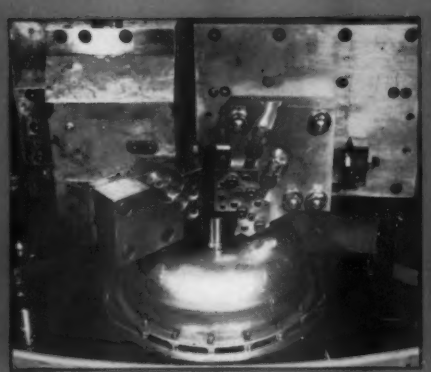
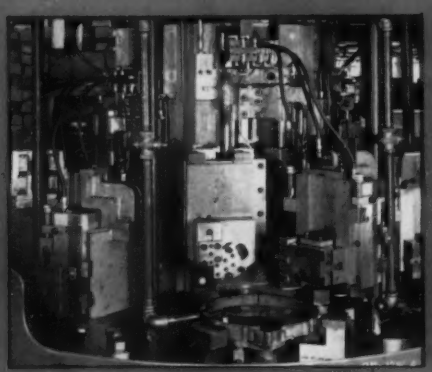
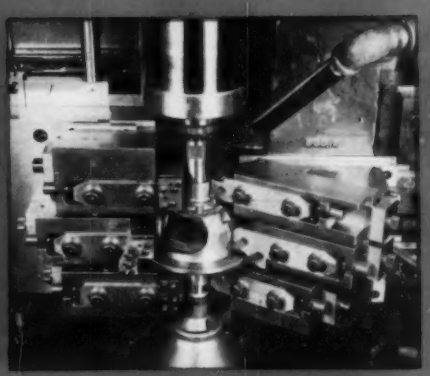
OR CONTACT YOUR NEAREST BULLARD SALES OFFICE FOR COMPLETE SPECIFICATIONS.



TORQUE CONVERTER HOUSING

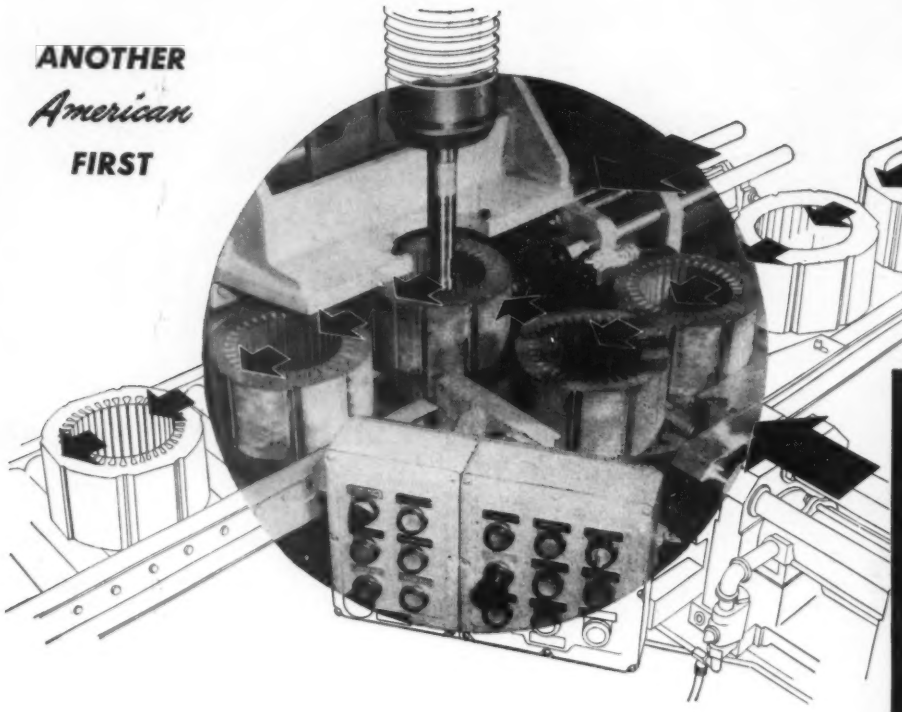


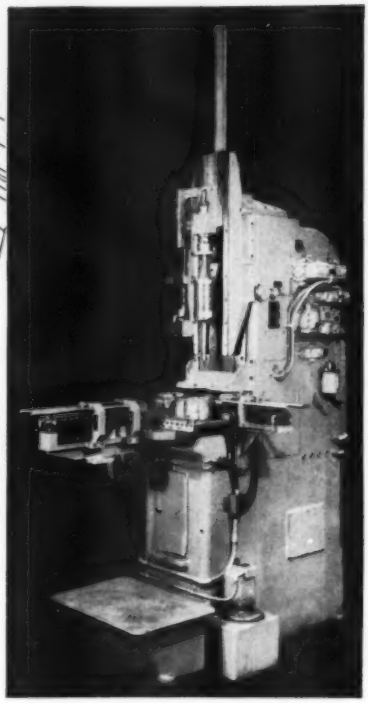
FLYWHEEL HOUSING



DIFFERENTIAL CASE

ANOTHER
American
FIRST





...completely AUTOMATED BROACHING

STATOR PARTS BROACHED IN 20 SECONDS

Installed in a conveyor line, this American 3-way broaching machine with a hydraulic broach retriever and electrical controls, broaches the I.D. of stator parts in a 20 second cycle. Parts coming into the machine are automatically shuttled into position, broached, and then discharged back on the conveyor line. Interchangeable broach arbors and broach shells make it possible to broach several different parts of similar size.

BEVEL GEAR BLANKS BROACHED IN 15 SECONDS

Using tooling similar to that illustrated, an American (PD) pull-down machine, installed in a conveyor line, automatically broaches the I.D. of a bevel gear blank in 15 seconds. By using interchangeable broach arbors and broach shells, over 20 similar bevel gear blanks are broached with this set-up.

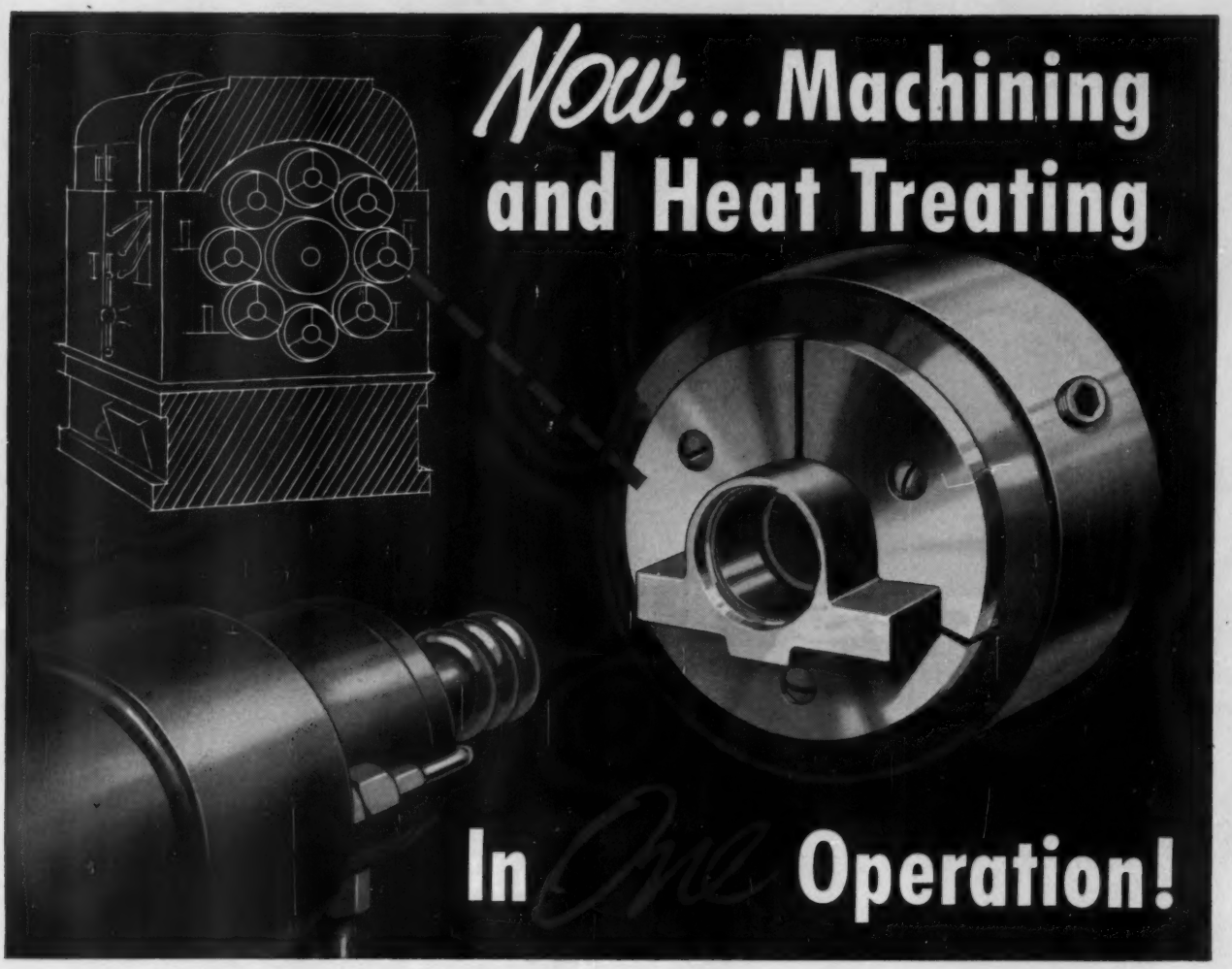
FOR AUTOMATED OR INDIVIDUAL BROACHING PROBLEMS — SEE *American*

American approaches each broaching problem as part of the complete production cycle. Broaches, fixtures and machines — all designed and built by American — provide a complete broaching service. Let American help you cut your production costs. Send part print or sample to get the solution to your broaching problem. *Ask for Catalog No. 450.*

AMERICAN *American* BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



with TOCCO Induction Heating

Mechanics Universal Joint Division of Borg-Warner Corporation now combines automatic heat-treating and metal-working operations on the same machine!*

A Tocco Inductor Coil, matched to one spindle of a multiple spindle automatic screw machine, heat treats the inside diameter of automotive trunnion cups—after they have been completely formed on the same machine tool. Twenty-two, 20 and 50 kw, 450,000 cycle TOCCOtron Induction Heating units and 44 automatic screw machines (installed here and in other plants) make up this high-speed production team.

This new method permits the use of SAE 1144 steel and eliminates costly, time-consuming copper plating and carburizing operations formerly required. Heating and quenching cycles total approximately 10 seconds per part, and production is in excess of 300 parts per hour from each machine.

If your products or their components require heat treating, soldering, brazing or forging it will pay you to investigate TOCCO for better, faster ways of producing them at lower unit cost.

* A patented process

Write for free catalog—**TOCCO Induction Heating.**

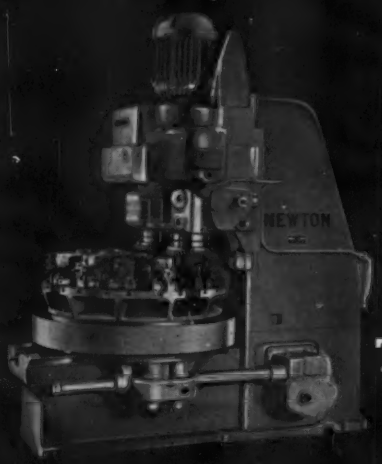
THE OHIO CRANKSHAFT COMPANY
Dept. B-9, Cleveland 1, Ohio

TOCCO

The story of the fastest known method for milling the flat surfaces of repetitive pieces...

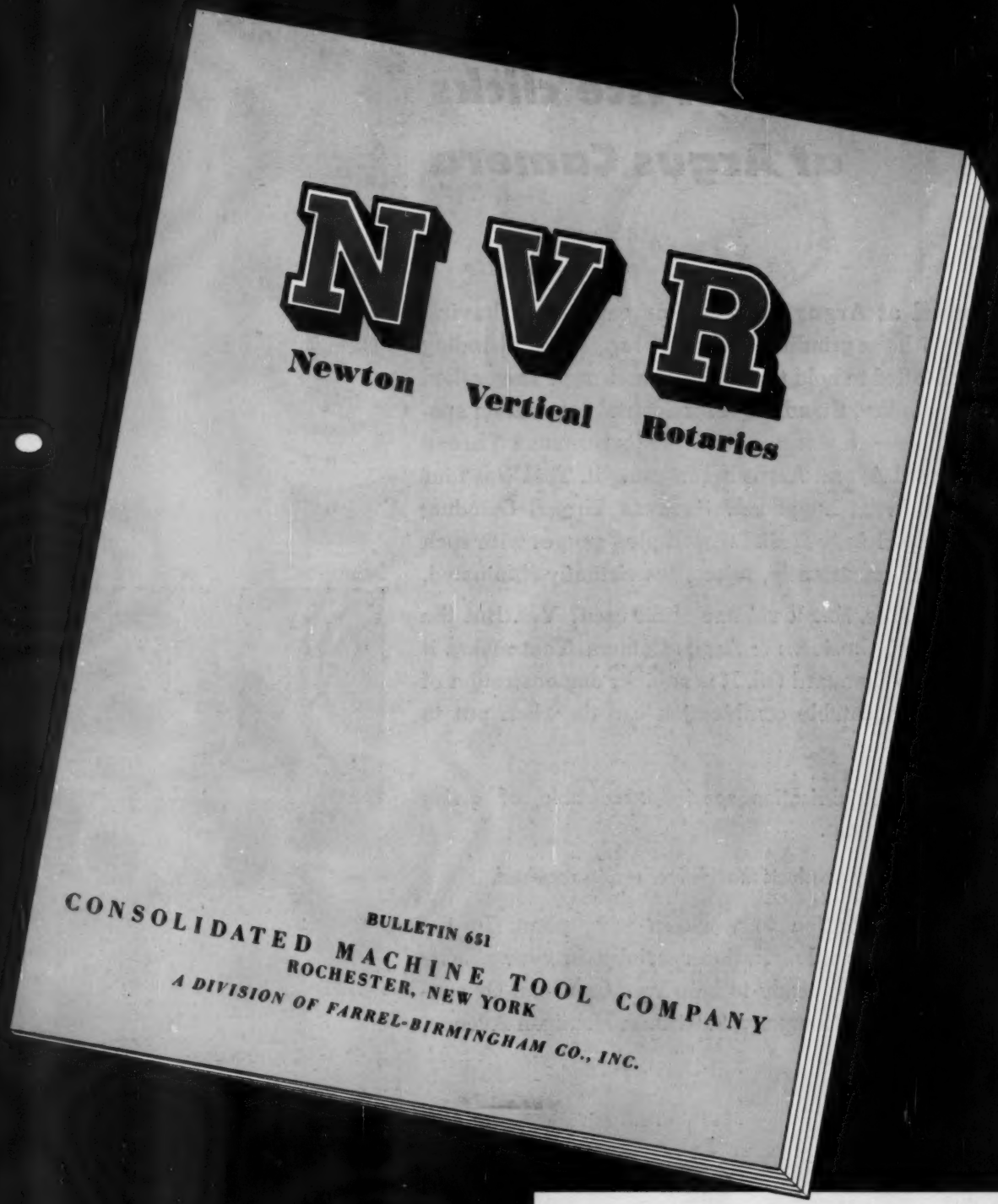
Here's the story..

40 interesting and informative pages on Newton Vertical Rotary Milling Machines that can lead to important savings even on short runs.



CONSOLIDATED MACHINE TOOL

A DIVISION OF FARREL-BIRMINGHAM CO., INC.



COMPANY ROCHESTER 10, N. Y.

CONSOLIDATED MACHINE TOOL COMPANY
565 Blossom Road, Rochester 10, N. Y. AM-85

Please send me without obligation your new Bulletin 651 giving the full story on Newton Vertical Rotary Milling Machines.

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Title.....

Firm Name.....

Address.....

City..... Zone..... State.....

STANDARD
technical service clicks at Argus Camera

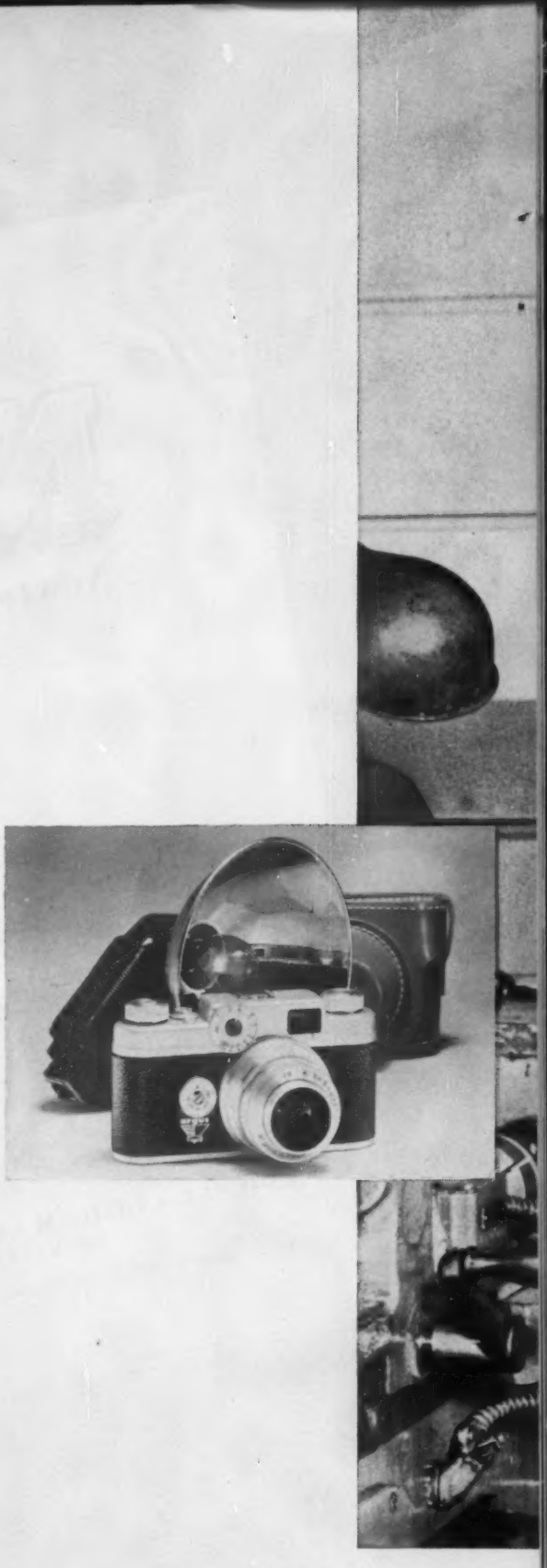
Personnel at Argus Camera Company were having trouble with the grinding of thread plug gauges. Grinding oils used failed to hold the required accuracy. They called in L. H. Walker, Standard Oil industrial lubrication specialist. He recommended Standard's SUPERLA Thread Grinding Oil A, and Argus began using it. That was four years ago. What happened? SUPERLA Thread Grinding Oil has helped Argus grind thread plug gauges with such accuracy, so consistently, rejects are virtually eliminated.

Small job? Yes. Small volume of oil used? Yes. But the results are big business to Argus Camera. That makes it important to Standard Oil. It is another demonstration of what this unbeatable combination can do when put to work:

1 Standard lubrication specialists capable of giving technical help.

2 Top quality products *that deliver results required.*

Put this combination to work in your plant. In the Midwest there is a lubrication specialist in your nearby Standard Oil office ready to help you. Call him. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



STANDARD

STANDARD OIL COMPANY
(Indiana)

Omer L. Parks (left), tool and gauge grinder for Argus Camera, inspects thread plug gauge with L. H. Walker, Standard Oil industrial engineer. Lyman Walker has been working with customers for 25 years helping them solve problems like the one at Argus. A native of Detroit, Lyman Walker is familiar with the lubrication problems of industry in the territory he serves. This together with his wide experience makes him ideally qualified for this work. Customers find his experience pays off *for them.*

MORRIS AIR-OIL-MATIC DRILL UNITS

Fast, low-cost production for drilling and allied operations.

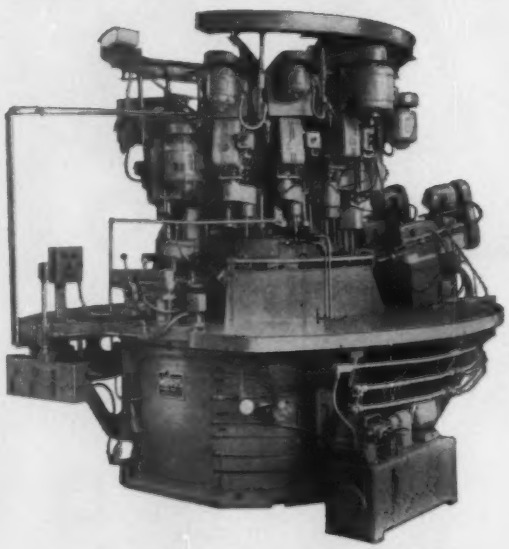
- Adjustable Feed
- Wide range of spindle speeds
- Convenient controls
- Hydraulically controlled

Available for use on Special Purpose Machines like the MORRIS High Production Machines illustrated.

MORRIS CAM-MATIC DRILL UNITS

Newly introduced, MORRIS CAM-MATIC Drill Units provide automatic, electrically controlled, mechanically driven drilling, tapping and allied operations . . with built-in accuracy, dependability and convenience. Specially-featured electric clutch provides automatic thrust control and dull or broken drill detection.

Morris MOR-SPEED



MORRIS HIGH PRODUCTION MACHINES

Special Operations with STANDARD Units

- Specialized Production
- Automatic Indexing and Positioning
- Multiple Operations
- Easy Model Changeover

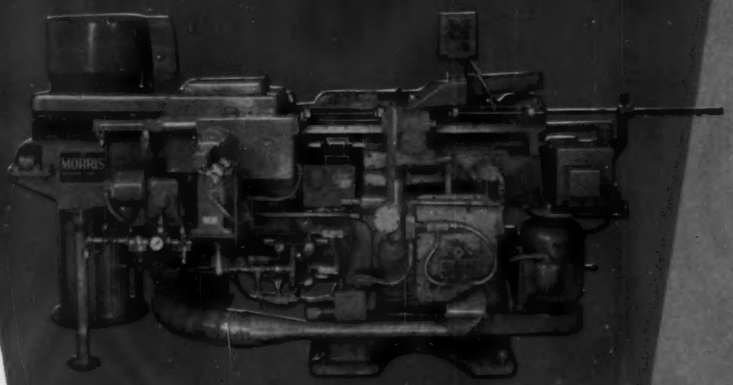
You can have swift, accurate production on multiple operations like drilling, reaming and tapping with MORRIS Mor-Speed High Production Machines. They provide special operations using standard units, with completely automatic operation. Easy re-alignment speeds model changeovers.

MORRIS MOR-SPEED RADIAL DRILLS

4 SIZES - 2 NEW UNITS
Centralized Controls

A complete line of heavy and light production radial drills feature centralized controls for ease of operation, fast production. Two new models utilize hydraulic control for push-button operation and pre-selected feeds and speeds . . . the easiest, fastest operation ever available.

MORRIS AUTOMATIC BALANCING MACHINES



COMPLETELY AUTOMATIC from load to unload, these machines produce up to 720 perfectly balanced pistons every hour. Units are balanced within one gram plus or minus for extreme accuracy required in finished product.

all new

MACHINE TOOLS

Designed for Production PLUS Precision

N E W . . . with proven performance, that's the story of these up-to-the-minute models of MORRIS Machine Tools. For more than 40 years, MORRIS has designed and manufactured high speed, precision equipment. The new models displayed on these two pages are the latest in a series of machine tools that have won the favor of the nation's leading manufacturers.

Your built-in benefit with these new MORRIS Mor-Speed Machine Tools is precise work at high speeds. Make your own comparison of MORRIS features with those of any unit. You'll see why the leaders demand MORRIS!

MORRIS MOR-SPEED MACHINE TOOLS have been selected by the world's leading manufacturers for low-cost mass production of precision-made parts and assemblies. Complete case history data is available FREE upon request.

Write today for catalogs concerning specific machines. If you prefer, outline your production problem. MORRIS engineers will make recommendations for its best solution.

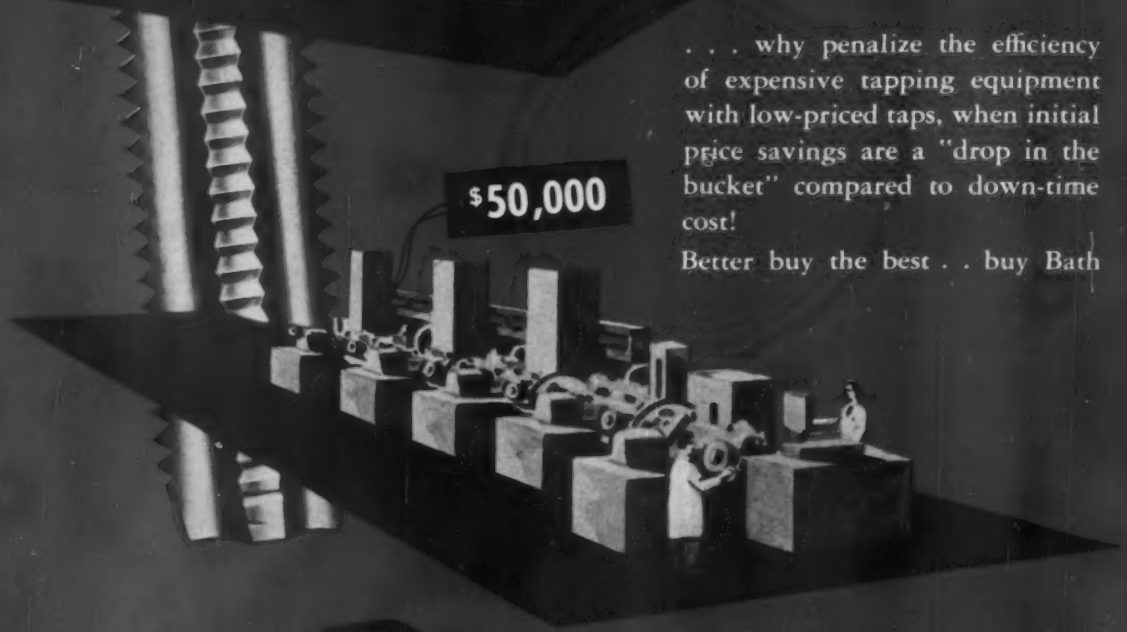
VISIT US AT BOOTH #912
The Machine Tool Show
Chicago, Illinois
Sept. 6-17, 1955
International Amphitheater

Mor-Speed Line

Morris

THE MORRIS MACHINE TOOL COMPANY
933 HARRIET STREET, CINCINNATI 3, OHIO, U. S. A.

whether your tapping equipment cost $500. or $50,000... you need the best taps money can buy!



. . . why penalize the efficiency of expensive tapping equipment with low-priced taps, when initial price savings are a "drop in the bucket" compared to down-time cost!

Better buy the best . . buy Bath

JOHN BATH & CO., Inc.

22 Grafton St., Worcester, Mass.

PLUG CYLINDRICAL AND THREAD GAGES • RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

Nary a slip 'twixt the job and the disc

PHOTOGRAPHED AT MORRISON STEEL PRODUCTS, INC.

One look at this new Resin Sander Disc by CARBORUNDUM tells you it's no sissy. One trial in your shop *proves* how tough it is. It bites into metal fast...cuts free and cool...stays sharp from start to finish. The rugged all-fibre backing, plus a resin bond with greater holding power, means far more work per disc. The edge holds shape longer, even on your most severe grinding jobs. Resin Sander Discs are designed for both snagging and surfacing operations, come in types and sizes to fit all Disc Sanders.

For a free demonstration of this new cost-cutter, call your CARBORUNDUM Distributor or salesman today. Or write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

Through application "know-how" and product quality

CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar

Diamonds are a tool's best friend

Grinding keen edges on cemented carbide cutting tools can be tricky. The material is extremely hard and brittle... easily harmed by excessive heat. CARBORUNDUM's new B-7 Resinoid Bond Diamond Wheels grind unusually free and cool—reduce the danger of checking or cracking the carbide. Less pressure is needed to achieve accurate sizing to close tolerances, and to produce razor-sharp edges. And CARBORUNDUM's Diamond Wheels hold form better, last longer... deliver greatly increased tool life. Ask your CARBORUNDUM Distributor or salesman for free copy of booklet, "Grinding Cemented Carbides," or write The Carborundum Company, Niagara Falls, N. Y. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ont.

Through product quality and application "know-how"

CARBORUNDUM

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continually puts more sense in your abrasive dollar

AGAIN . . . LATHE LEADERSHIP FROM LODGE & SHIPLEY

15 | **NEW**

Powerturn LATHES

Exclusive new ___

Computing HEAD

. . . fast, fool-proof indication of correct speed settings!

Centri-trol CONTROLS

. . . all controls conveniently grouped, distinctively shaped!

Turning problems into production is a built-in specialty of these New Lodge & Shipley POWERTURN Lathes. From headstock to tailstock..... and down to the floor..... POWERTURN Lathes are designed to facilitate turning to new, higher levels of profitable operation.

The many new features add importantly to Lodge & Shipley Lathe ability to produce more at lower cost.

New POWERTURN Lathes are produced in 13", 16", and 20" Standard Engine, Toolmaker, Gap, Manufacturing and COPYMATIC types.

Write for new literature on POWERTURN Lathes ..... newest and best from *The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.*

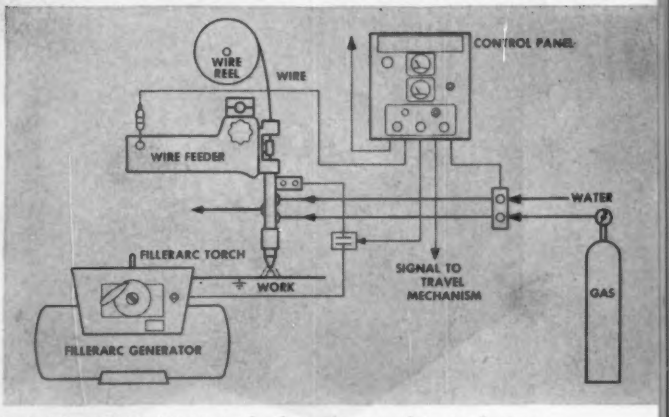
Features

- Positive brake
- Greater swing over cross slide
- Micrometer carriage dial
- New chip and coolant pan
- Redesigned feed levers
- Direct-reading cross and topslide dials
- Square base compound rest
- Built-in horsepower ammeter
- Front-mounted tailstock handwheel

THE MACHINE TOOL SHOW

See it NOW... See it at THE MACHINE TOOL SHOW!
September 6-17. Booth 502

WELDING ARCS NEWS



G-E FILLERARC EQUIPMENT is the only complete equipment especially designed for consumable-electrode gas-shielded welding. Simplicity of the system makes possible use of less expensive fixtures and greater over-all efficiency.

NEW G-E Automatic Welding System Uses CO_2 to Slash Gas Costs 95%

FILLERARC . . . first *complete* equipment designed especially for automatic gas-shielded welding; combines unique generator with low-cost carbon dioxide—for sound welds on mild steel.

General Electric's new Fillerarc Automatic Welding Equipment brings you—not only 95% savings in shielding-gas costs—but *sound welds on mild steel.* The great savings possible through use of CO_2 as a shielding agent have long been recognized—but good mild steel weld quality has never been obtained. Now, after two years of successful application of Fillerarc equipment on non-ferrous metals (using inert gas), G-E engineers bring you the total solution for mild steel welding—*savings plus high quality.*

95% SAVINGS ARE POSSIBLE because CO_2 costs only *1/20th* as much as inert gas. For the average job, Argon would cost $5.00 per hour, CO_2 only twenty-five cents. This means yearly savings per equipment may be as high as $20,000 on a 3-shift, 60% duty cycle basis. This new G-E system can now replace the submerged arc method on many jobs and eliminate many of the problems associated with granular flux.

EXCLUSIVE G-E GENERATOR practically eliminates the erratic weld quality formerly obtained with CO_2. Here's why: Only the G-E Fillerarc generator—with its exclusive *rising* volt-ampere characteristic— supplies an arc length which always remains constant, even with adjustments in wire speeds. This means minimum weld porosity and spatter—and deep penetration for extra-strong welds.

COMPARED TO OTHER INERT-GAS SYSTEMS, G-E Fillerarc equipment . . .

- Reduces gas costs 95%, for yearly savings up to $20,000 per equipment;
- Delivers consistent weld quality because of the unique G-E Fillerarc generator;
- Assures constant speed; system is insensitive to normal line-voltage changes;
- Provides wire-feed speeds as high as 1000 I.P.M.

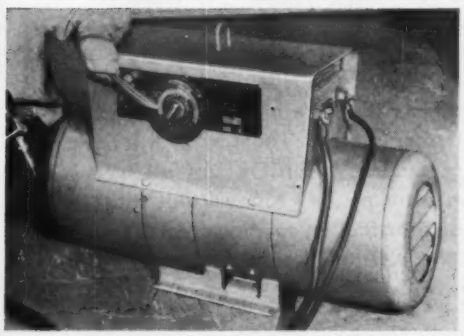
COMPARED TO FLUX-SHIELDED METHODS, G-E automatic Fillerarc equipment . . .

- Deepens penetration with low-cost CO_2;
- Provides a visible arc for full control of weld quality, permits less expensive fixtures;
- Does not use abrasive flux—especially important in welding compressor housings and similar jobs;
- Eliminates stubborn flux slag; cleaning costs are greatly reduced;
- Eliminates expensive flux recovery systems.

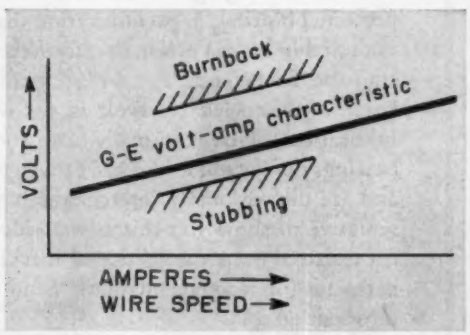
FOR MORE DATA contact your G-E welding sales engineer—and write for bulletin GEC-1334 to Section 713-1, General Electric Co., Schenectady, N. Y.

SEE G-E automatic Fillerarc equipment demonstrated at the National Metal Exposition, Philadelphia, October 17–21.

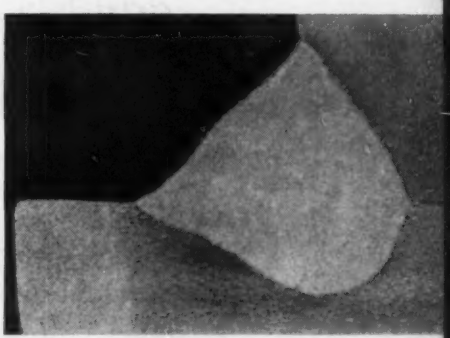
Why the complete G-E system makes possible quality mild-steel welds with CO_2



G-E SELF-REGULATING GENERATOR is the heart of the Fillerarc Automatic Welding system. Unique rising volt-amp curve maintains constant arc length.



RISING VOLT-AMP CURVE of the exclusive G-E Fillerarc generator matches rising arc curves . . . does not get into area of burnback and stubbing. Resulting high weld quality is uniform.



DEEP PENETRATION is produced by short arcs and faster wire speeds tpyical with Fillerarc equipment. Above: weld on semi-killed steel.

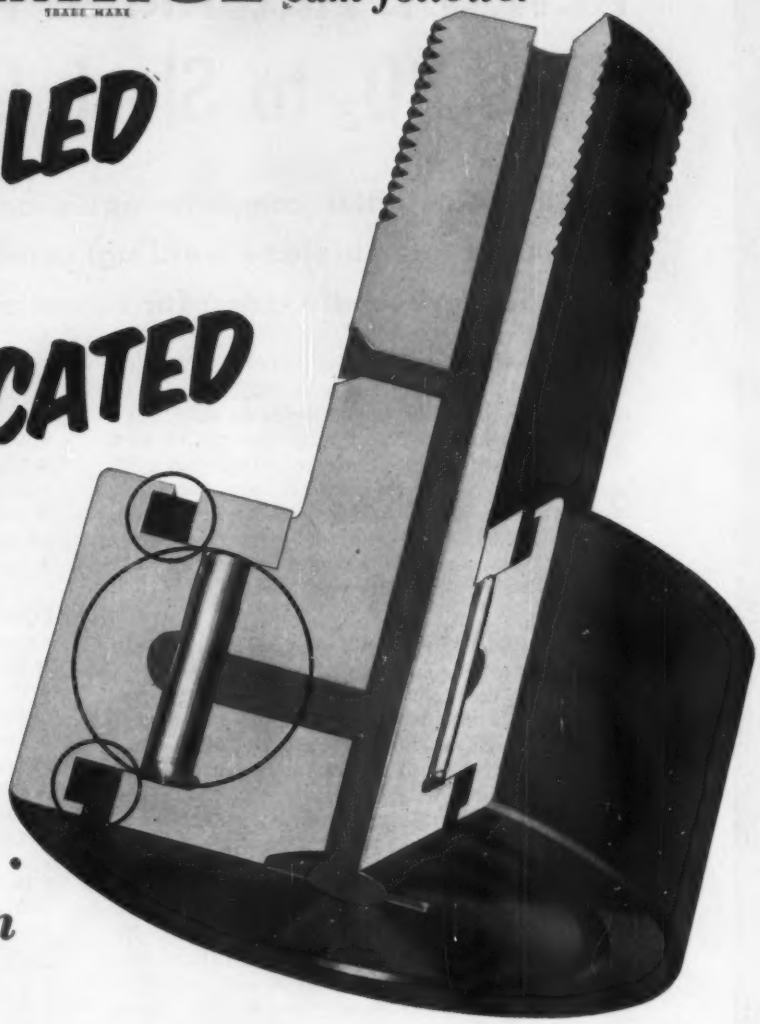
Progress Is Our Most Important Product

GENERAL ELECTRIC

the NEW McGILL® **CAMROL** *cam follower*

TRADE MARK

NOW SEALED and PRELUBRICATED



to eliminate contamination . . . save re-lubrication

McGILL®

SCF series

CAMROL

TRADE MARK

bearings

Write for your copy today

In one simple assembly, the Sealed CAMROL cam follower bearing gives you three big advantages: 1. capacity to withstand the shock and load of cam action, 2. sealing against contamination that would impair the life of an unprotected bearing, 3. prelubrication that saves frequent relubrication so often undesirable in cam action application. Specially traeated seals are built in at stud and flange ends, and a black oxide finish offers outside corrosion resistance. A channeled reservoir in the outer raceway bore helps store reserve lubrication sufficient in many cases for lifetime service. The new SCF series bearings do not add to the size or weight of standard CAMROL cam followers and are dimensionally interchangeable with them. Ask your McGill representative to show you this newest McGill contribution to the superior performance of your cam actioned machinery, or write to our engineering department for recommendations. Send for Bulletin SCF-55 for more detailed information.

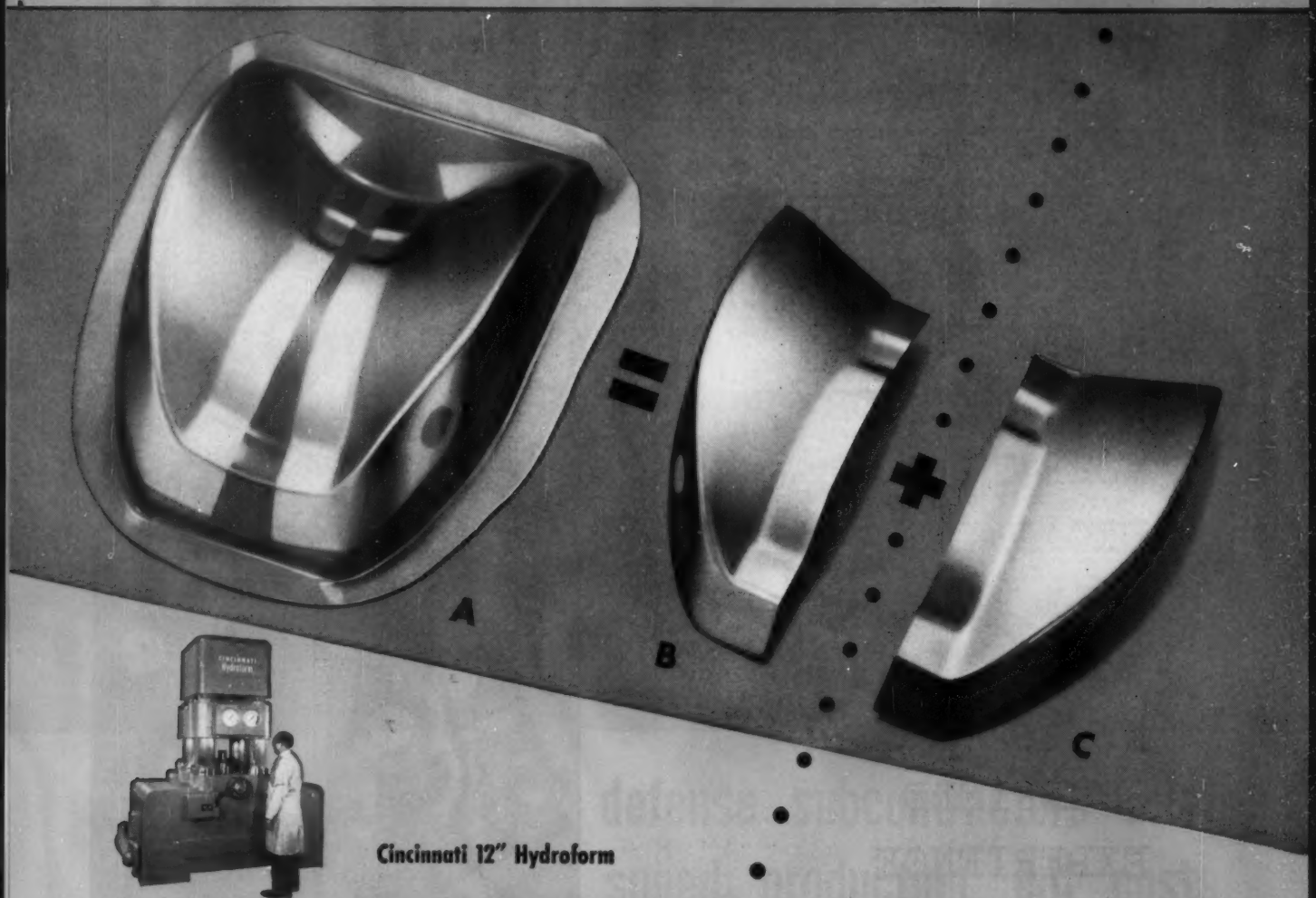
50th McGILL Anniversary

Insure performance with McGILL®...

MULTIROL®—GUIDEROL®—**CAMROL** *full type roller bearings*

McGILL MANUFACTURING COMPANY, 300 N. Lafayette Street, Valparaiso, Indiana

Tricky automotive part gets the Hydroform treatment



Cincinnati 12" Hydroform

With the help of the Cincinnati Hydroform, a supplier to the automobile industry has greatly simplified his production of complex-curved, right-hand and left-hand body structural components.

In the example illustrated above, shape "A" was accurately developed, then readily drawn on a 12" Hydroform from a 10¼" dia. blank of 20 gage cold rolled steel. (Note the extreme variations in contours.) Parts "B" and "C" were produced simply by sawing the parts out of the drawn shape. Shape "A" has been masked and paint sprayed, forming guide lines for sawing.

Tool costs were exceptionally low. The Hydroform punch was cast to shape in Kirksite. The draw ring was made from ordinary steel, with a band-sawed opening for the punch.

A similar Hydroforming procedure to that described above is being used successfully, with very substantial time and tool-cost savings, for the forming of duct sections for jet engines from heat-resisting materials.

Have you fully investigated the many Hydroforming advantages . . . and if Hydroforming can be profitably applied to your work? Let a Cincinnati Milling field engineer give you complete information. For a description of the Hydroforming process and specifications of the 8", 12", 19", 23", 26" and 32" machine sizes, write for Bulletin M-1759-3.

Hydroform

PROCESS MACHINERY DIVISION

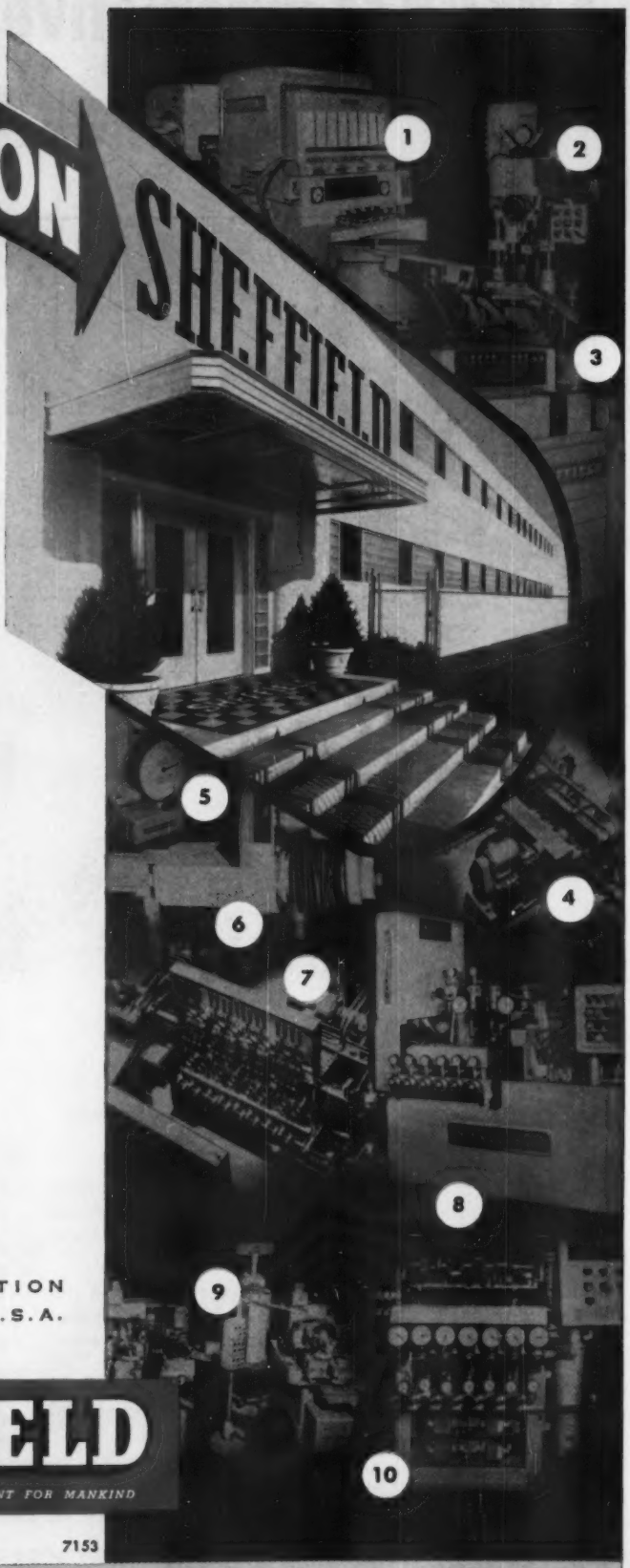
THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

CINCINNATI

AUTOMATION

AND
AUTOINSPECTION
SYSTEMS, CIRCUITS
AND CONTROLS
HAVE BEEN OUR
BUSINESS FOR
MORE THAN A
DECADE. IT
WILL PAY YOU
TO CHECK YOUR
NEEDS AGAINST
SHEFFIELD
EXPERIENCE



WRITE DIV. 510 FOR BULLETIN NO. AU-1154

THE SHEFFIELD CORPORATION
DAYTON 1, OHIO, U.S.A.

SHEFFIELD MASTER CRAFTSMAN HEADQUARTERS

SHEFFIELD

MANUFACTURING AND MEASUREMENT FOR MANKIND

7153

1. Gaging cylinder bores for selective assembly
2. Controlled honing of gear blank bores
3. Automatic gage for 100% inspection of small arms ammunition
4. Connecting rod inspection
5. Controlling the grinding of ball bearing races
6. Post-process size control of bearing races
7. In-line inspection of automobile part
8. Controlling 12 grinding machines
9. Controlling bore size of pinion blanks
10. Automatic gaging of crankshaft main bearings

How can these skills of small business help you?

Many experienced G-E defense subcontractors offer capacity to help you speed production, cut costs

Over the past years thousands of small businessmen have developed special valuable skills and services as suppliers and subcontractors on G-E defense projects. Today G-E is vigorously at work on many vital defense programs; but as the Armed Services iron out the high volume peaks brought about by the Korean crisis, some of these highly trained G-E subcontractors have the capacity to work on other civilian or defense projects.

Experience in "operation teamwork"—G.E.'s long established policy of sharing defense orders with small business—means that these small companies have the knowledge and ability to meet exacting specifications and produce parts and assemblies with speed and efficiency.

Their special skills, tools and machines contribute greatly to the defense effort, in speeding production and in cutting costs. Many have diversified their subcontracting activities and have developed marketable products of their own, thus adding to the peacetime economy.

Today most of these small businesses continue to contribute to the defense effort and all of them serve as part of the broad base upon which the future defense of America depends. Many of them, though, now have capacity in excess of current demands and may be able to apply their talents and skills to help solve your production problems.

6491

HERE'S HOW SMALL BUSINESS CAN HELP YOU...

GENERAL ELECTRIC

CASE 1

Name: Universal Machine Co., Fenton, Michigan
Part Manufactured: Housings, casings, retainers, sheet metal fabrications, etc.
Facilities: 65 skilled machinists in modern plant
Record: Co-operative, experienced, quality producer

CASE 2

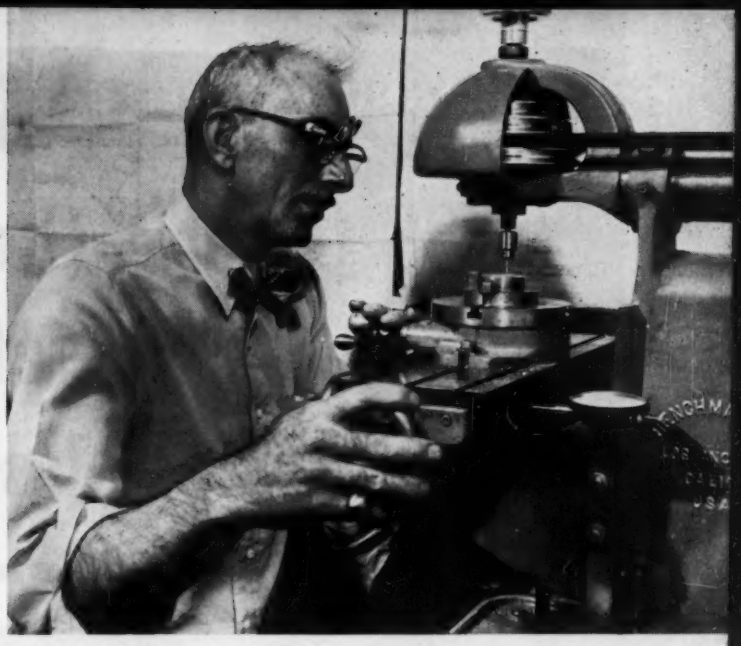
Name: Meco, Incorporated, Paris, Ill.
Part Manufactured: Aluminum and stainless steel parts; weldments
Facilities: Added machinery and increased engineering staff: total employees 275
Record: Outstanding performance record since 1950; recently expanded operations in the field of electronics

CASE 5

Name: Varo Mfg. Co., Inc., Garland, Texas
Part Manufactured: Electronic components for armament system
Facilities: New plant with adequate equipment and 297 employees
Record: A very satisfactory, quality job on complex equipment

CASE 6

Name: J. Leukart Machine Co., Columbus, Ohio
Part Manufactured: Rings, gear cases and other precision aircraft parts
Facilities: 150 machinist and engineers in up-to-date plant
Record: Excellent quality source that consistently meets delivery schedules; experienced in machining titanium



CASE 3

Name: Watson Manufacturing Company, Jamestown, N. Y.

Part Manufactured: Sheet metal fabrication

Facilities: Completely modern plant with up-to-date equipment

Record: Delivery performance has been excellent

CASE 4

Name: Corry Instrument Co., Corry, Pa.

Part Manufactured: Bar spray, nozzles

Facilities: Modern plant housing 30 technicians

Record: Accurate manufacture of parts requiring extremely close tolerances. On-time delivery

These representative case histories show what the nation—and G.E.—gained from small business skills

The six small business firms shown here, with their manpower, skills and equipment, are representative of the more than 17,000 subcontractors and suppliers (for example, on jet engines 80% of them small businesses) who have teamed with General Electric in the production of defense equipment during the past five years.

Their record is enviable.

Often required to produce parts of extremely close tolerances and deliver in shorter-than-possible time, many of these small businesses have more than met their obligations. In terms of vital time saved and the consequent speed-up of defense production, their contribution has been of incalculable value to the defense effort.

What these typical firms and many others like them have done, teamed with General Electric, they may be able to do for you. 649-1

Can Small Business Help You?

Thousands of small businesses, like the six illustrated here, have furnished General Electric with practically every kind of skill and service as defense subcontractors and suppliers.

Many of these companies have available production capacity, created in large part by the reduction of defense orders since the Korean War peak. This means that they may be able to apply their skills to help you with your production.

If you have a manufacturing problem or have work available for subcontracting, please write us on your letterhead stating in as much detail as possible the type of services or skills you require. We will be glad to suggest several small businesses who have done similar work for us and may be able to help you.

Write to C. W. Bryant, Manufacturing Services Division, General Electric Co., 570 Lexington Ave., New York 22, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

A MANUFACTURER SAYS:

"USS Carilloy Steel increases life of mold bases for plastics"

MR. L. J. MORRISON, VICE-PRESIDENT, DETROIT MOLD ENGINEERING COMPANY

BOTH SIDES of the Carilloy Steel bars are machined simultaneously on this duplex milling machine. Carilloy is furnished in 12-foot lengths, up to 18 inches wide, and 1 to 6 inches thick, to a hardness of 225 Brinell.

BIG ADVANTAGES of Carilloy Steel for mold bases are its durability and exceptional cleanness. Part of a mold base is shown here being ground flat and parallel, just prior to assembly. Detroit Mold Engineering Company now uses about 2,000 tons of Carilloy for mold bases yearly.

DETROIT MOLD ENGINEERING COMPANY, Detroit, Michigan, got into the business of manufacturing mold bases for plastics in 1940. They first used USS Carilloy Steel in their bases in 1946, under their trade name of D-M-E No. 2 Steel, and have been rapidly increasing their use of it since then.

Why? Let Mr. L. J. Morrison, Vice-President, tell you:

"After the war, to secure improved availability and quality, we switched to Carilloy. The initial higher cost was more than offset because Carilloy machined more easily and greatly increased the life of our bases.

"Another thing it did was enable us to make mold bases for die casting. Since die casting molds also required steel of exceptional cleanness, machinability and strength, the use of Carilloy enabled us to successfully enter this new market.

"Our business has more than tripled since we first started using Carilloy, and we feel that high-quality Carilloy Steel is largely responsible."

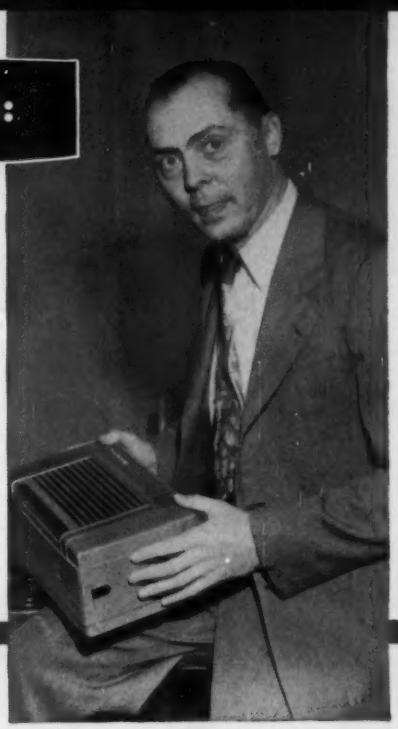
Now read the reaction, on the next page, of a plastics molder who uses D-M-E bases made of USS Carilloy Steel.

USS CARILLOY

AND ONE OF HIS CUSTOMERS SAYS:

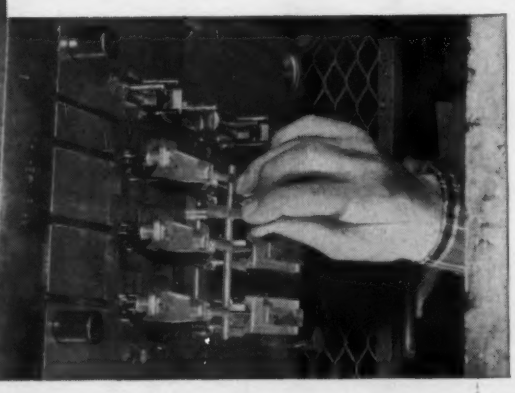
"For abusive molding jobs we always use bases of USS Carilloy Steel"

MR. E. A. BERECZ, GENERAL SUPERINTENDENT, GENERAL DIE MOLD COMPANY



EXTRAORDINARY is this instance where the mold cavity is machined directly into the Carilloy Steel base, because of the high pressure involved and the large number of pieces to be made.

HALF A MILLION OF THESE have been made by General Die Mold Company. It is a plastic insulator for a television antenna. Separate mold cavity was used here, mounted in a Carilloy Steel base supplied by Detroit Mold Company.



GENERAL DIE MOLD COMPANY, Chicago, Illinois, makes a staggering variety of plastic parts for radio and television sets, electric appliances, air conditioners, automobiles, toys, and other products. They consider USS Carilloy Steel's extreme ruggedness, and long life essential in mold bases for all really tough molding jobs.

Here's why, as told by Mr. E. A. Berecz, General Superintendent:

"We tool the actual mold cavity out of separate pieces of steel, then mount them in these Carilloy Steel bases, or we may machine the mold cavity directly into the Carilloy base. On many jobs, the bases must withstand constant abuse and extreme pressure—up to 450 tons. And we often must make 100,000 or more identical parts in a single order. With Carilloy Steel, we can put a base in and forget about it. It doesn't break, get out of line, or chip. We're thoroughly pleased with this high calibre performance."

Any time a longer lived steel, a tougher steel, a stronger steel, a more versatile steel might improve your product or cut your costs, call in a USS Service Metallurgist. He can help you choose the best steel, can offer you Carilloy Steels to any AISI analysis, or to a special analysis to meet unusual requirements.

UNITED STATES STEEL CORPORATION, PITTSBURGH
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION,
WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

See the United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

STEELS

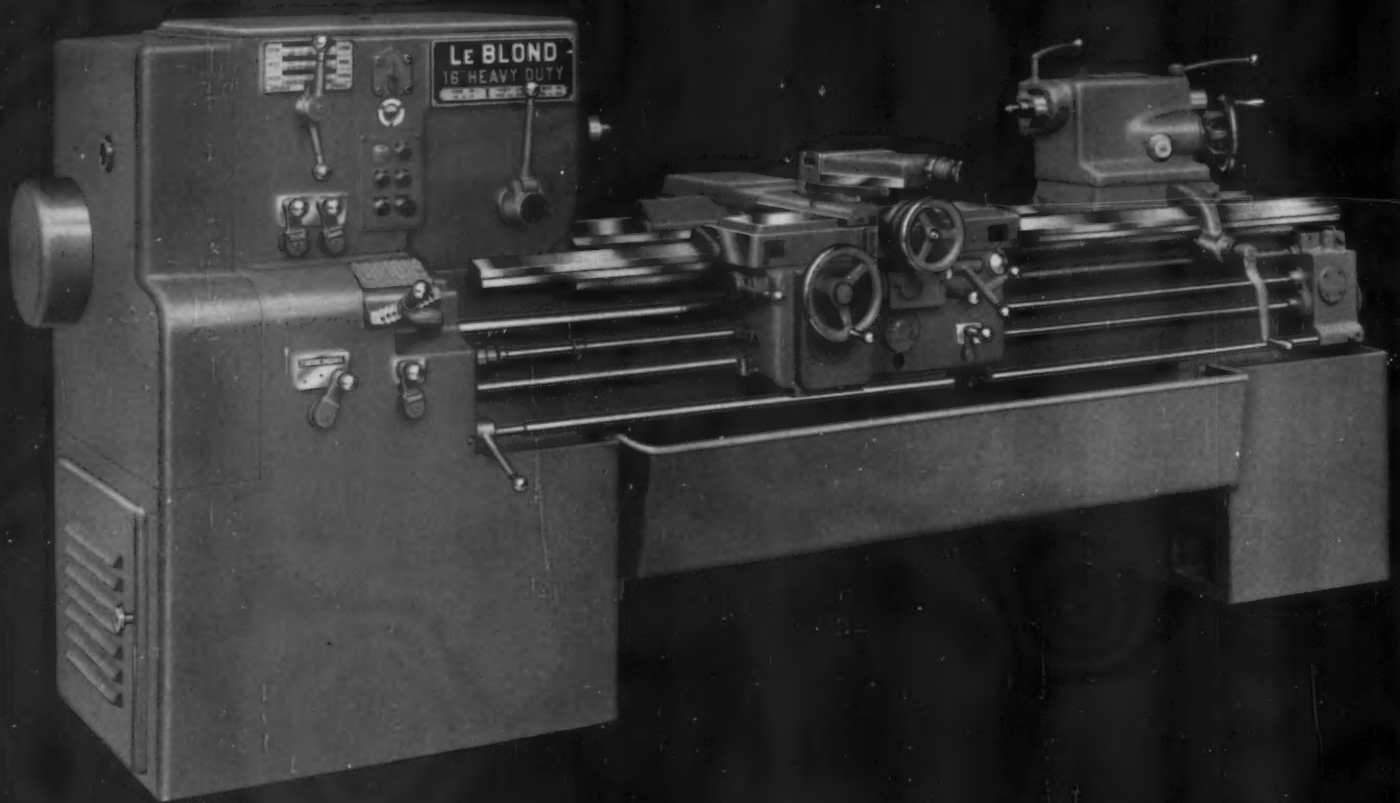
USS

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

UNITED STATES STEEL

cut with confidence . . . **HERE'S THE**



New LeBlond 16" H.D. Heavy-Duty Lathe

NEW LeBLOND

16" HEAVY DUTY

stamina plus with precision

LeBlond heavy-duty engine lathes have always been known for their outstanding stamina—the inherent ability to stand up to the toughest turning jobs with precision, year after year. Our new 16" Heavy Duty is the most rugged, yet precise machine of its class that we've ever built!

The new headstock uses our proven combination gear-belt drive to give you a complete range of 27 spindle speeds from 16 to 2000 rpm chosen by direct-reading color plate. You get maximum power and smoothness from the 20-hp motor whether you're roughing or finishing—18 speeds are gear driven; 9 higher speeds are driven through a positive Gilmer-type belt that requires no adjustment. Free-running spur gear design assures minimum no-load friction horsepower . . . shafts and gears not needed for a given speed remain idle, do not consume power uselessly.

For a new degree of speed and convenience, a single lever controls the four-way power rapid traverse built into the apron. Both length and cross feed through a positive-jaw clutch are controlled by a single lever. Lubrication is entirely automatic. Bedways are hardened and ground steel inserts fitted to LeBlond's compensating veeway principle for better distribution of cutting forces. Quick-change box is totally enclosed. New tailstock uses the exclusive LeBlond thrust-lock design with a quick-set length dial.

For consistent and precise production, you can't do better than the new LeBlond 16" Heavy Duty. Call your nearby LeBlond Distributor or write for Bulletin HD-126A.

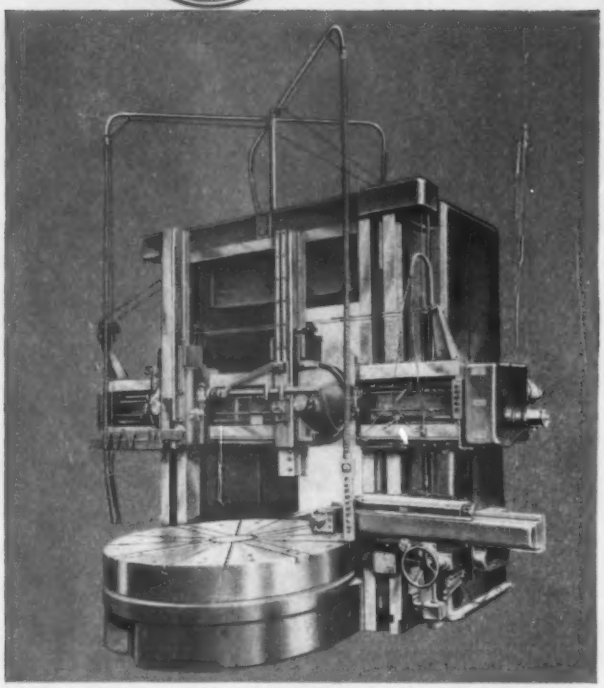
. . . cut with confidence

THE R. K. LEBLOND MACHINE TOOL COMPANY
CINCINNATI 8, OHIO

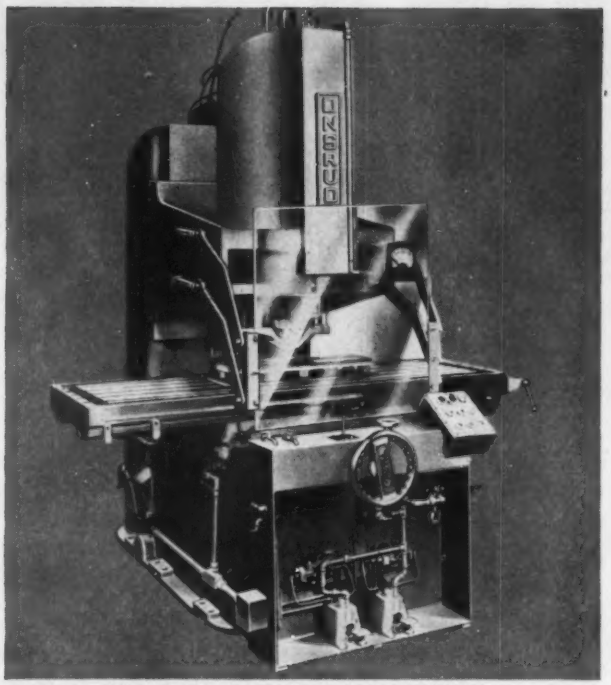
LeBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 68 YEARS*

Designer's

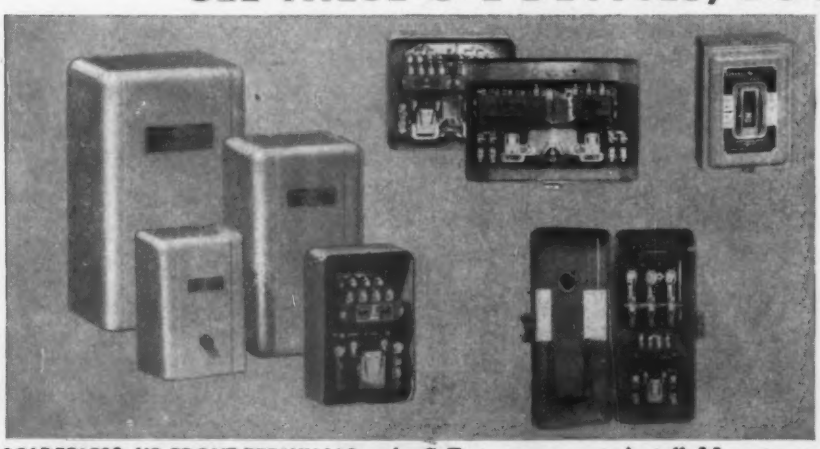


GIDDINGS AND LEWIS VERTICAL BORING MILL is driven by G-E direct-current motors, utilizes G-E all-electric tracer control for fast, accurate production. Control automatically follows templates, controls any number of motions.

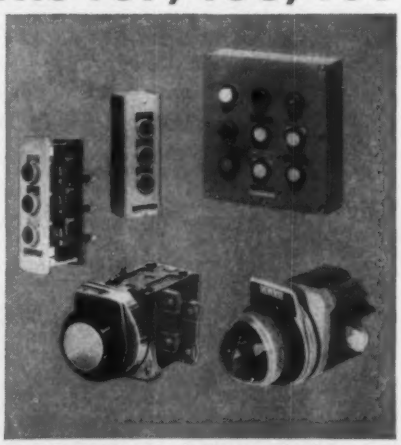


ONSRUD MACHINE WORKS INC. A-42 INVOMILL for high-speed, nonferrous metal milling, profiling and routing uses three electronic amplidyne feed drives. General Electric devices control longitudinal, transverse and circular motions.

SEE THESE G-E DEVICES, BOOTHS 107, 108, 109

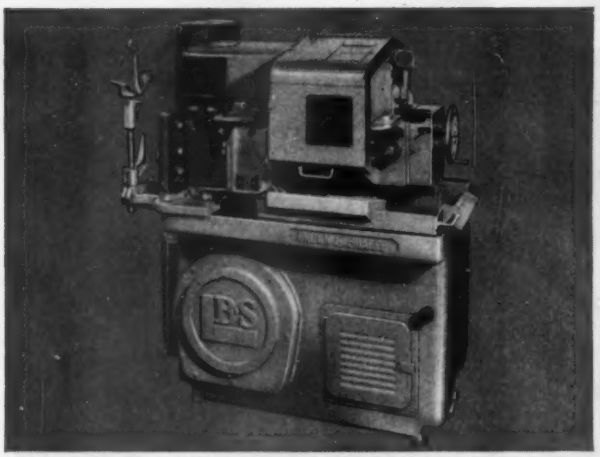


SOLDERLESS, UP-FRONT TERMINALS make G-E starters easy to install. Many types are available including combination, reversing, multispeed, and manual and magnetic for full- or reduced-voltage starting. They feature G-E strongbox magnet coil, enclosed in a tough molded plastic case for better protection against dirt, oil and moisture; special alloy contacts for long life; and permanent air gap that can't wear down. All popular NEMA and special enclosures are in the General Electric line.

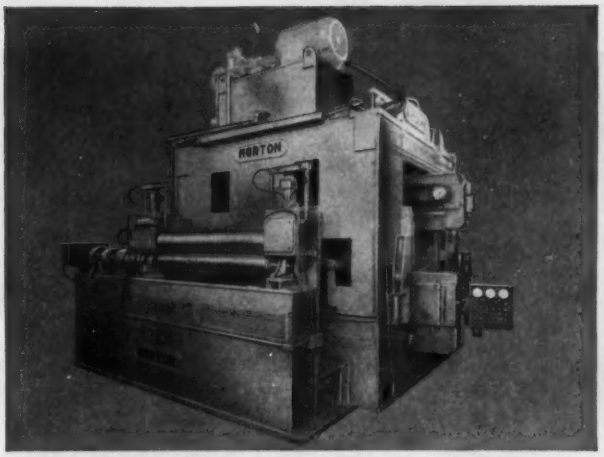


COMPLETE LINE includes standard, heavy-duty, and oiltight push buttons. Stations are made in all NEMA type enclosures. "Building-block" flexibility of the oil-tight line permits any combination of units in 1–16-unit stations.

GENERAL ELECTRIC



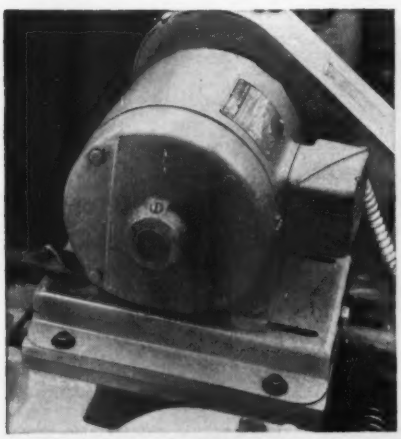
BROWN AND SHARPE AUTOMATIC SCREW MACHINE, compactly designed to occupy little space, is equipped with General Electric Tri-Clad* motors, General Electric magnetic switches, relays, capacitors and push-button stations.



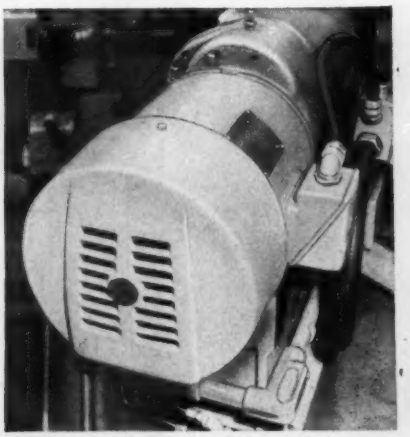
MORTON SHEAR-WELD-TRIMMER, operated by G-E motors, is controlled by a General Electric motor control center, which features extra large wiring trough, vertical bus barrier, easily removable starter units, and front connection.

Wide range of G-E components will help new machine tools increase production

PRODUCTION ENGINEERING SHOW



MORE HORSEPOWER IN LESS SPACE makes G-E Tri-Clad* '55' motors ideal for machine-tool applications. (Dripproof motor above.) General Electric's new design permits weight reduction up to 33% in some ratings, size cuts up to 40%. Installed on the newest machine tools, Tri-Clad motors give a neat, compact, modern appearance. Available in a wide range of ratings and enclosures, they're easy to handle, easy to install, and reduce shipping and handling costs of your product.



LONGER MOTOR LIFE is engineered into each Tri-Clad '55' motor. (Totally enclosed fan-cooled motor above.) Cast-iron frame, new cooling and insulation systems, and fully sealed conduit box mean long, reliable service in even the most adverse conditions—abrasive or conductive dusts, or where coolant is present. These features are prompting the big "motor switchover" in which 80% of G-E motors sold in the ratings in which Tri-Clad '55' motors are available, are built to these specifications.

By 1964 the estimated demand for goods and services from all industry will increase 40%. The available work force, however, will increase only 13%. To provide for industry's future needs, therefore, tomorrow's machine tools must be faster, more efficient, and more automatic in operation.

Setting the pace are progressive manufacturers exhibiting these and other new machine tools at the Machine Tool Show. General Electric components help improve the tools' performance and raise output standards to meet or surpass predictions.

G.E. offers designers literally thousands of machine tool components, continually redesigned and improved in extensive development and research facilities that help make up G-E engineering leadership. A few of the new machine tools with G-E components exhibited at the show are described on these pages.

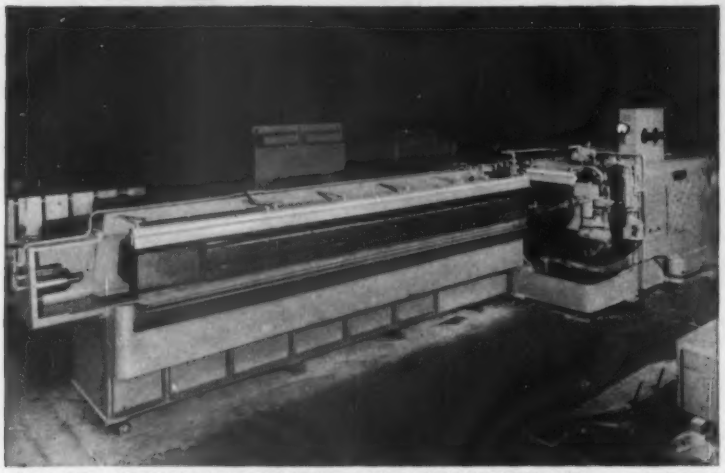
For further information, contact your nearest G-E Apparatus Sales Office, or write to Sect. 668-124, General Electric Company, Schenectady 5, N. Y.

*Reg. trade-mark of General Electric Co.

TURN PAGE FOR MORE SHOW ISSUE NEWS

Designer's

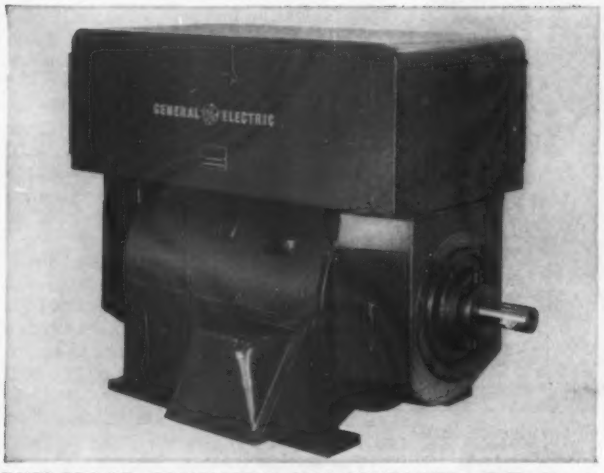
CONTINUED FROM PREVIOUS PAGE



LAPOINTE HORIZONTAL SURFACE BROACHING MACHINE is designed with G-E broach drive including 50-hp d-c unit-cooled motor, 50-kw unit-cooled m-g set, exciter and control. It achieves speeds up to 300 fpm and more with smoothness and flexibility never before possible.

THIS CLEARING INCLINABLE 60-TON PRESS employs a G-E Tri-Clad ▶ motor, G-E control panel with G-E nonreversing starter, G-E control transformer, and G-E relays and oiltight push buttons. Unusually small control panel is easily accessible to the machine operator.

Designers of modern machine tools build in

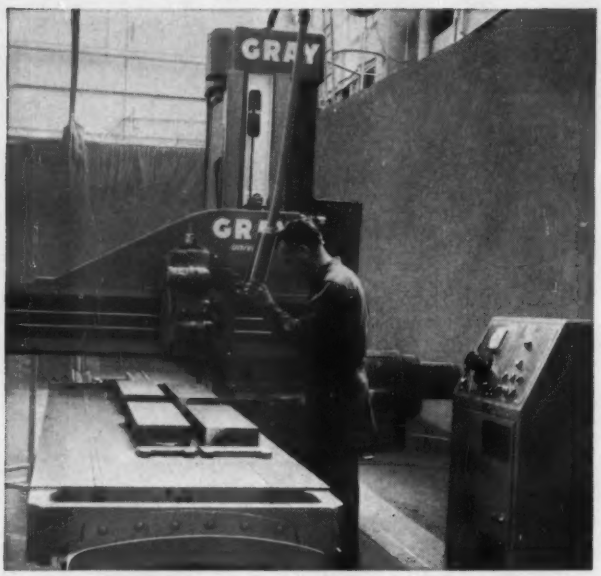


DUST-PROOF, COMPLETELY SELF-CONTAINED, G-E direct-current totally enclosed unit-cooled motor is especially suited for broaching machines like the LaPointe model above. These G-E unit-cooled d-c motors require no external duct work or air filters, yet provide your machines with dependable driving power even in severe atmospheres. Two independent air flow systems circulate air internally and externally, while an air-to-air heat exchanger, part of the unit cooler, dissipates heat losses. Standard units, ready for your designs, are available in all standard ratings from 15 to 200 hp, in constant or adjustable speed types.

NEW, SMALLER, LOW-COST TACHOMETER GENERATOR solves many speed measurement and control problems in machine-tool design. It occupies minimum space, can be flange- or foot-mounted, and installed horizontally or vertically. Its high versatility permits it to be direct-coupled, geared, or belt-driven, according to your needs. Two models are available. For use as a pilot exciter on many control applications and for speed indication, the high output-voltage unit of 100 volts per 1000 rpm is ideal. For speeds up to 5000 rpm a 50-volt per 100-rpm model is available. Both have a conduit box tapped for a 2½-inch connection.

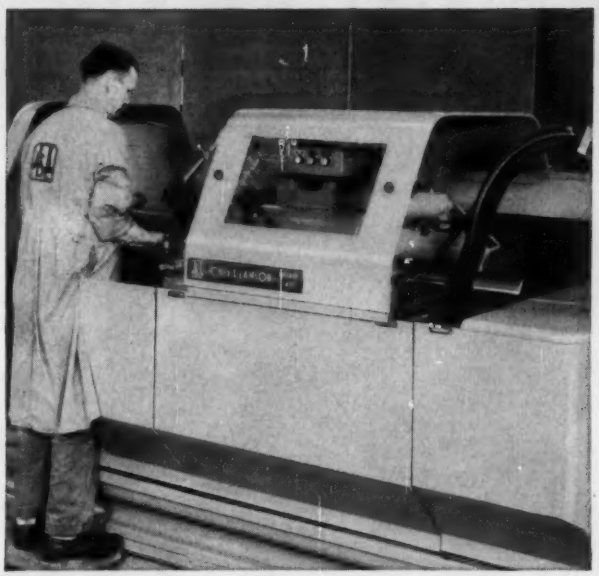
Digest

SHOW ISSUE FEATURING EXHIBITS AT THE MACHINE TOOL SHOW



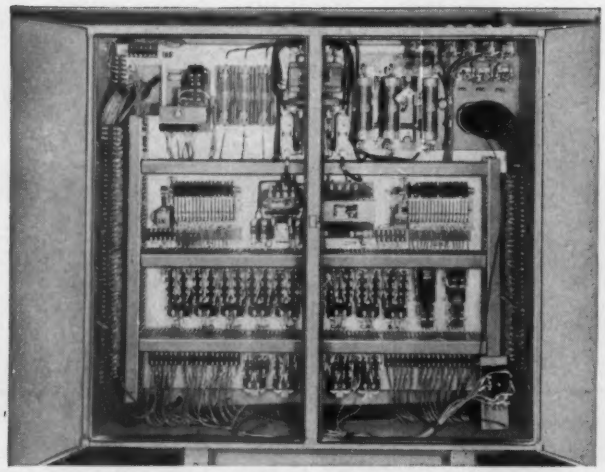
GRAY UNIVERSAL PLANER uses one G-E planer-drive system including an m-g set with exciter, main d-c drive motor, planer limit switch, tachometer generator, and three Tri-Clad* motors. Uniquely, it cuts on both forward ***and*** reverse stroke.

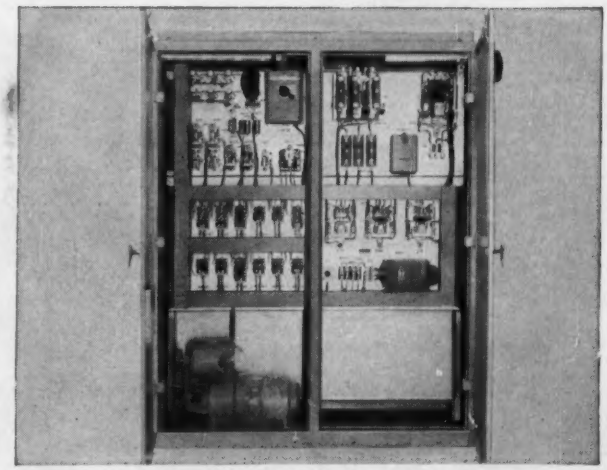
*Reg. trade-mark of General Electric Co.



JONES AND LAMSON AUTOMATIC LATHE, equipped with a custom-engineered G-E industry control panel, shown elsewhere on this page, is a four-cut, fully sequential, hydraulically-controlled lathe with a 45-degree tracing slide.

G-E components for quality and reliability





CUSTOM-BUILT G-E CONTROL PANELS are specially engineered for each application. The panel at left, for example, was built for the Jones and Lamson lathe shown at the top of the page. These panels save machine-tool designers time, effort and cost because General Electric designs and tests them for your specific needs. This reduces the load on your own design and drafting staffs, releases them for other projects. You save on inventory and storage costs of components, and eliminate assembly and wiring, cutting installation costs. General Electric's extensive service facilities include 37 Apparatus Service Shops offering 'round-the-clock service, easily reached by your customers everywhere. 668-125

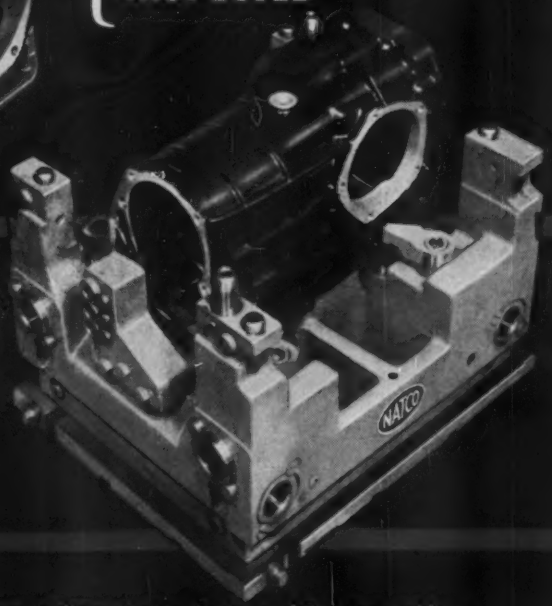
GENERAL ELECTRIC

MORE TRANSMISSION CASES AT LESS COST.....

55 PARTS per HOUR

201 OPERATIONS ON EACH PART

DRILLED, BORED, REAMED, TAPPED, SPOTFACED, CROSS-FACED, MILLED, CHAMFERED and INSPECTED



Parts are loaded into individual holding units which are conveyed through the machine automatically. After machining is completed, chips are removed and the holding units pass through a washer and are returned to the first station.

for answers to your Drilling, Boring, Facing and Tapping problems

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DETROIT, *10138 W. McNichols Rd.*
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COMPETITIVE THROUGH
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THE
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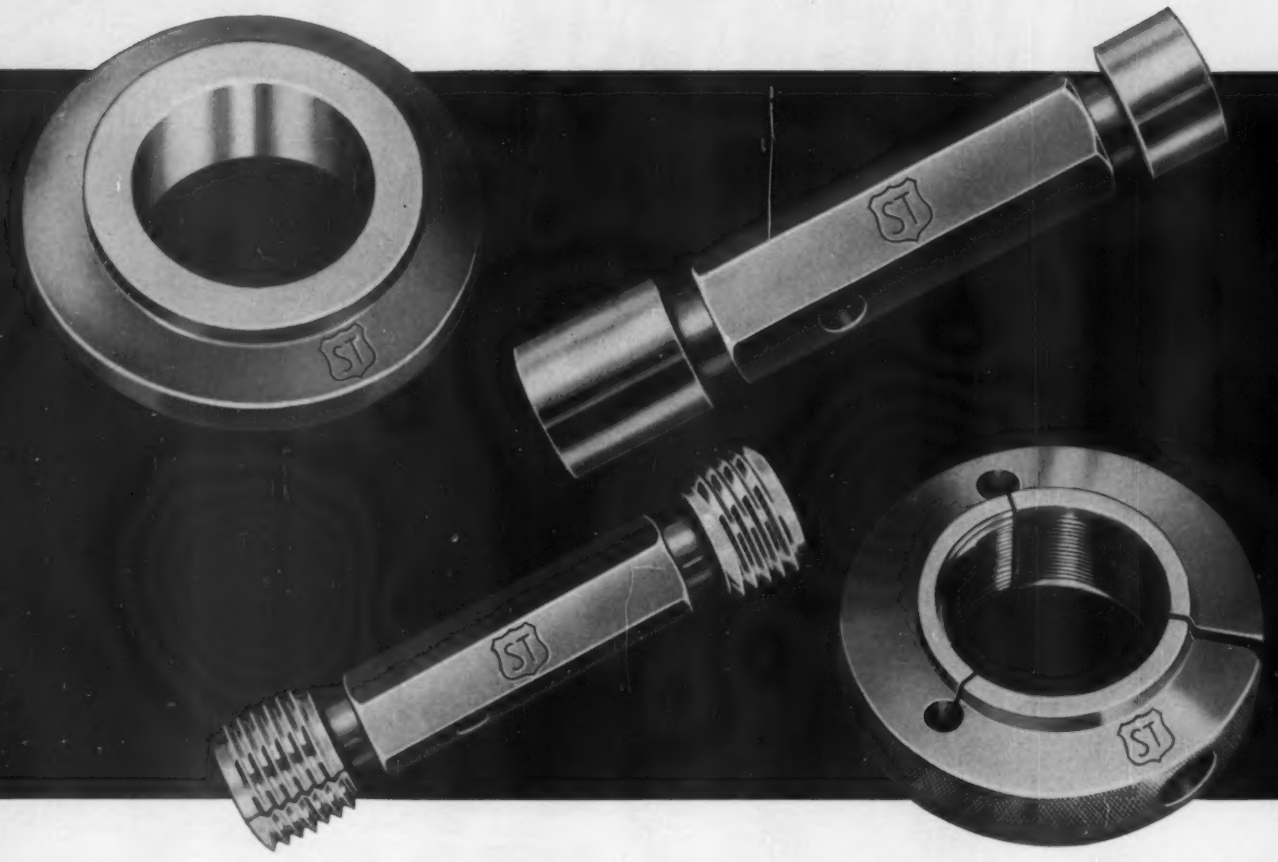

STANDARD TOOL ... *serving Industry since 1881*

presents its new complete line of cylindrical and thread gages – plugs and rings

The same quality and accuracy that is built into Standard's complete line of metal cutting tools

Now available through Standard Tool Co.'s Distributors

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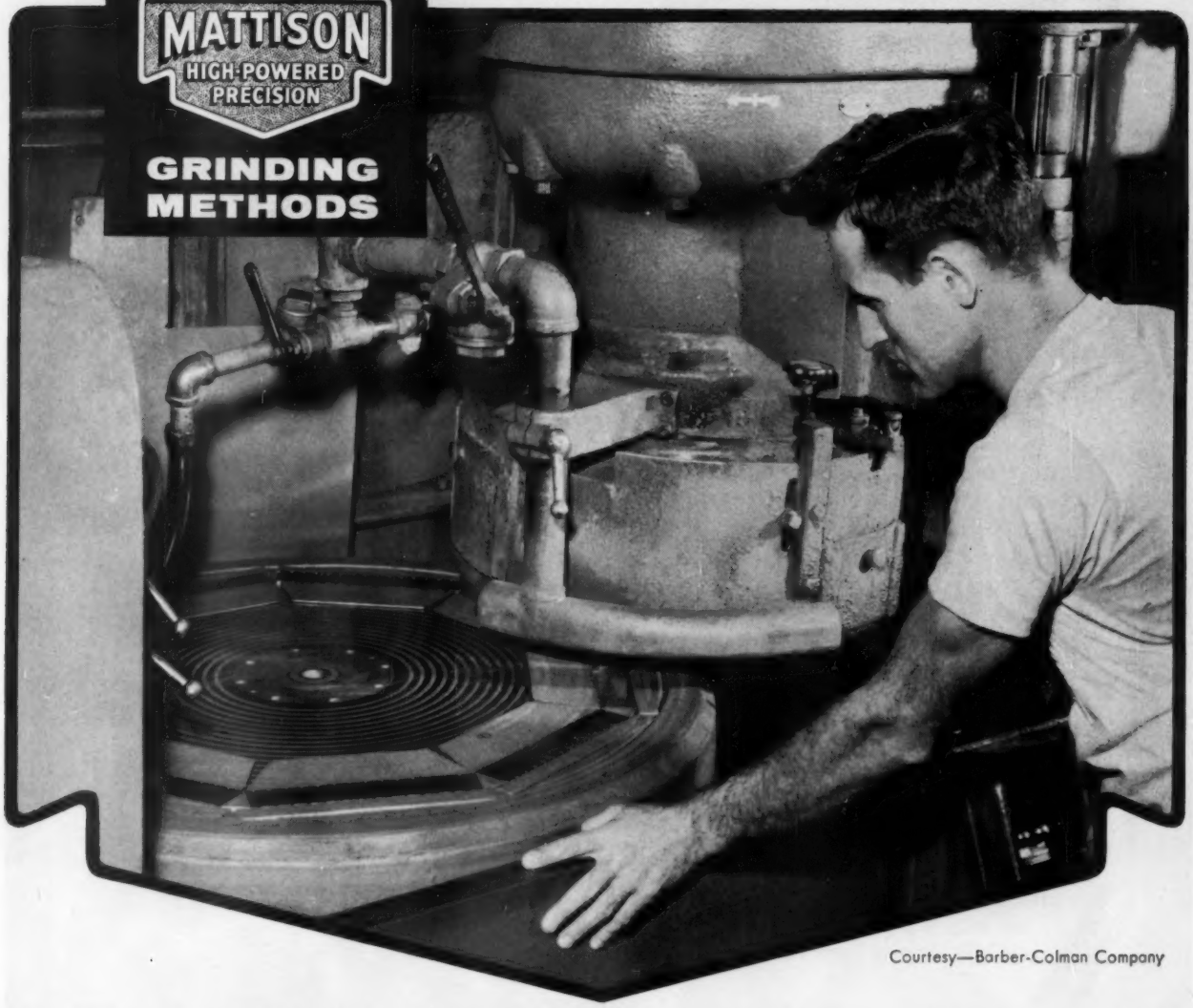
CASE HISTORY NO. 7—H-S STEEL REAMER BLADES

MATTISON
HIGH-POWERED PRECISION

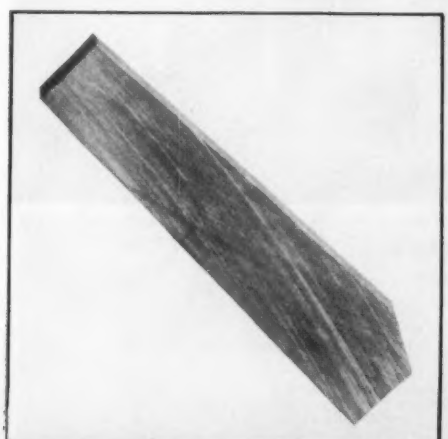
GRINDING METHODS



Courtesy—Barber-Colman Company

Grinds 262 reamer blades per load

. . . holds size and flatness within .0003"



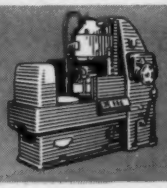
Unretouched photo, with blade purposely lighted to exaggerate cross-grind finish, which averages 10-12 micro inches, r.m.s.

For over ten years the Mattison No. 36 Vertical Rotary Surface Grinder has finish ground these hardened reamer blades without loss of accuracy.

On the job shown, for example, 262 blades are ground per load on both sides, holding size and flatness within .0003"—easily under the .0005" limit. Blades are M-3 (Type 1) high-speed steel. Spindle is set at 90° to the chuck. User reports exceptional cross-grind finish (averaging between 10 and 12 micro inches, r.m.s.) using a 60 grit segmental wheel.

The reason Mattison Grinders give you greater accuracy *longer* is quite simple. The extra-heavy and extra-wide vertical column is *one* solid piece, bolted to the end of the base. "V" and flat column ways are longer, wider, and thicker. This prevents the wheel head slide from binding and "cramping," and permits the machine to feed accurately in increments as fine as .0001". The wheel head adjustment is close to the spindle, too, which simplifies "tilting" and promotes accurate grinding on a wider variety of work. Write for Bulletins 144 and 146 describing the numbers 24 and 36 Vertical Surface Grinders.

MATTISON
MACHINE WORKS
ROCKFORD, ILL. U.S.A.



HIGH-POWERED
PRECISION
SURFACE GRINDERS

The man who needs a new machine tool and doesn't buy it is paying for it anyway...

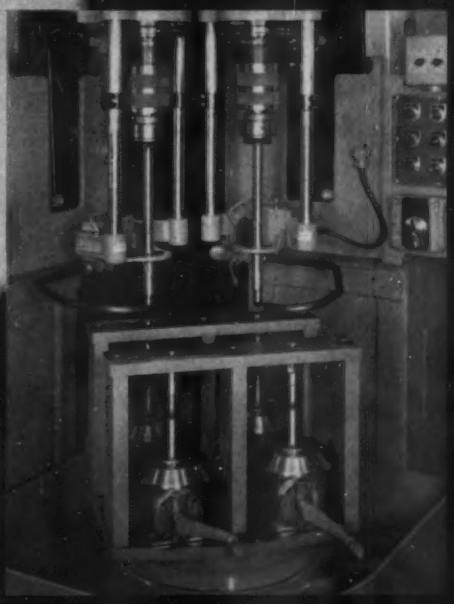
in scrap losses

Age alone doesn't obsolete machines. There are other factors. Consider the closer tolerances of two- or three-tenths now being demanded on the production line. Many a machine tool installed only five years ago can't hold to these precision tolerances. Any attempt to do so results in high scrap losses.

Consider the design of the machine. Today there is less dependence on the skill of the operator. Less subjection to human inconsistency. The built-in controls on machines utilizing the latest processing techniques minimize the problem of rejected parts.

One process with which industry obtains precision-production is Microhoning. This low-velocity abrading technique, employing low speeds and removing stock over a wide area, produces parts to exact dimensional and geometric accuracy. Microhoning uses a self-aligning tool with self-sharpening abrasives. There are no chucks to wear out of alignment; no off-tolerance parts because of dull tools or abrasive wheels needing dressing.

Check your scrap losses. Then decide whether you can afford to keep machine tools that cannot produce to current precision-production standards. You may discover that the money your scrap is costing you would buy a new Microhoning machine.



PART:
Shaft, Convertor Reactor

PROBLEM:
Flame hardening caused shaft to bow, resulting in a high scrap rate.

SOLUTION:
Microhoning — removed from .004" to .008" stock from the diameter, generated a straight, round bore and eliminated scrapping of parts.

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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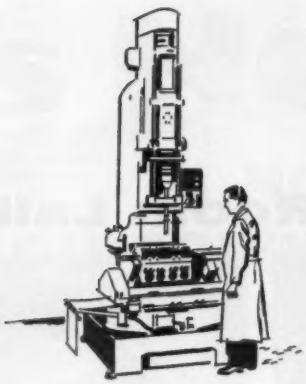
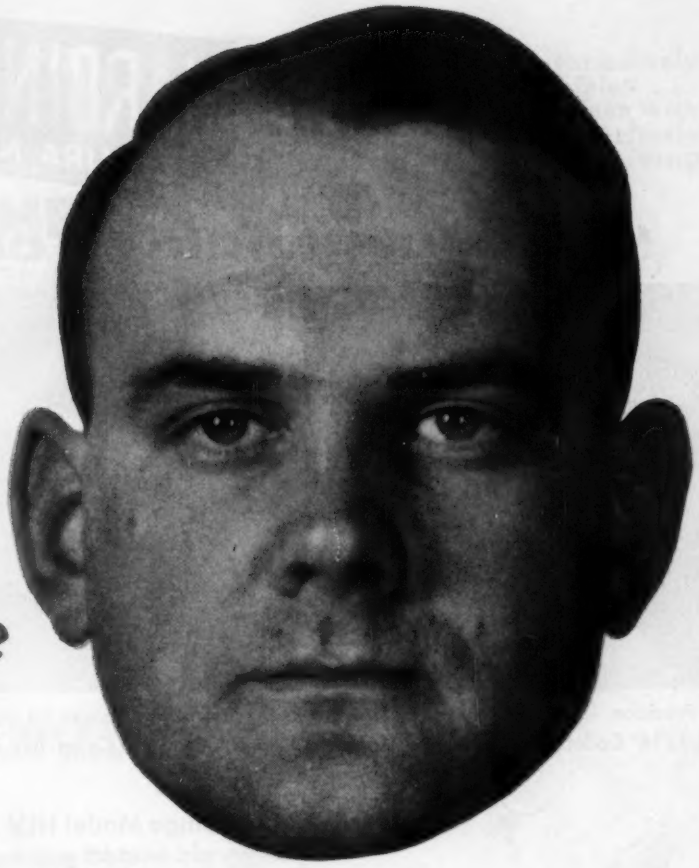
***MICRO-PRECISION DIVISION* • 2205 Lee Street, Evanston, Illinois**
Hydraulic Controls • Diesel fuel injection equipment





"Today... Rejection rate is NIL!"

A large Midwest pump manufacturing company had run up against an expensive finishing problem. They were using a super finisher with an abrasive stone to cut and polish 410 stainless steel shafting to a four micro finish. The hardness of the shafting was Rockwell B60-90. Although they tried a number of honing fluids recommended by various companies, the rejection of finished shafting was high and stone life was short. On a routine call, Sinclair Industrial Representative P. W. Stevens was asked for his recommendations.

Light-bodied coolant recommended...

Mr. Stevens reports, "Examination showed the need for a light-bodied coolant specifically designed for use as a honing fluid for both ferrous and some non-ferrous metals. From previous experience with a similar problem, I recommended Sinclair HONOL Medium."

Problem solved...

Mr. Stevens continues, "The company tried Sinclair HONOL Medium on a test basis. A follow-up showed they were getting exceedingly fine finish and accuracy, with sufficient carry-off of steel particles during the honing operation. The amount of heat generated was kept to a minimum, thus preventing distortion of parts. The company reports that today their rejection rate is nil. Moreover, all pieces have the desired four micro finish, and stone life has increased considerably. This manufacturer now specifies Sinclair HONOL Medium for his finishing operations, and uses the same product for honing brass."

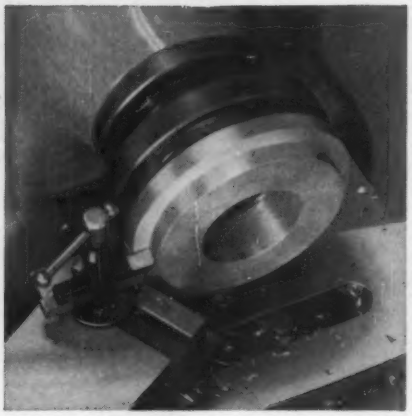
Why not let a Sinclair Lubrication Engineer help solve *your* lubrication problem. *There's no obligation.* Contact your local Sinclair office or write Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N.Y.

SINCLAIR LUBRICANTS

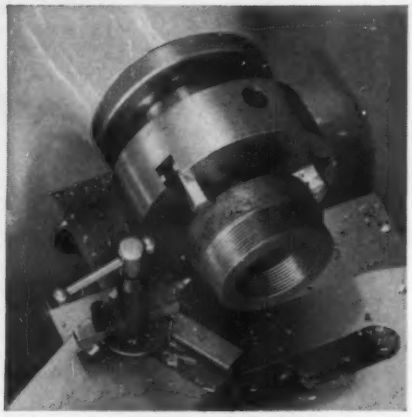
HARDINGE
ELMIRA, N.Y.

"The Outstanding Tool Room Lathe"

Precision Collet work for all sizes to 1-1/16" Collet seats *directly* in spindle.



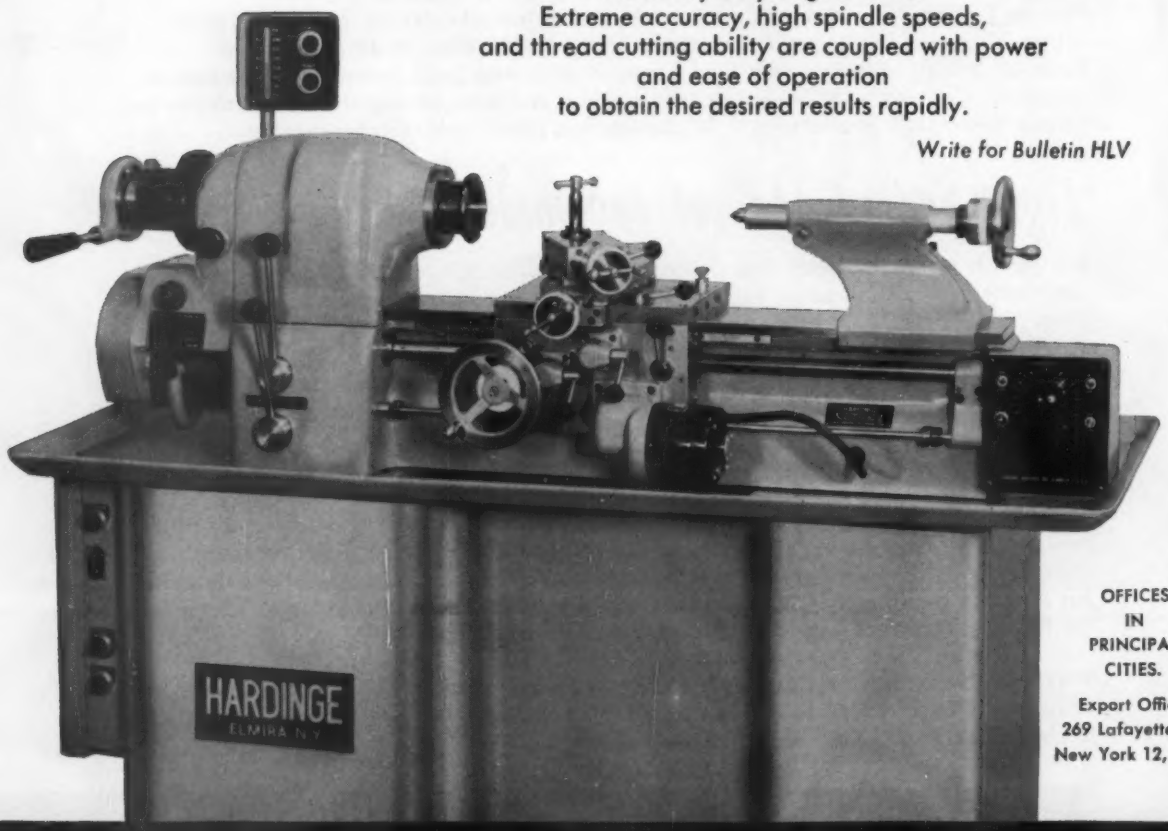
Precision Step Chucks for diameters up to 6". Provides Collet-like accuracy.



Integral Mount Jaw Chucks for precision holding of regular or irregular shapes up to 5".

Hardinge Model HLV 10" Lathe was primarily designed to fill a very old existent gap between the plain precision bench lathe and the heavy duty engine lathe.
Extreme accuracy, high spindle speeds, and thread cutting ability are coupled with power and ease of operation to obtain the desired results rapidly.

Write for Bulletin HLV



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HARDINGE BROTHERS, INC., ELMIRA, N. Y.

It's New!

A NO IMPACT HOLDDOWN SYSTEM FOR SHEARS

The Lodge & Shipley "No Impact" holddown system means *no* mars, *no* dents, *no* holddown clatter . . . and you still get positive holding power for accurate cutting, unsurpassed by any shear!

With the new Lodge & Shipley holddown system eliminating impact *and* damage, you can now shear the softest, most highly polished metals without impact mar. This "soft touch with terrific holding power" is a Lodge & Shipley exclusive!

Also available, for standard shearing, is the proven Hydro-Hold holddown system which offers positive, fast acting operation!

ASK ABOUT IT at The Machine Tool Show—Lodge & Shipley Booth 502. Also, be sure to see the All-New Shear and Press Brake.

In Shears, Too . . . Your Lodge-ical Choice

Lodge & Shipley

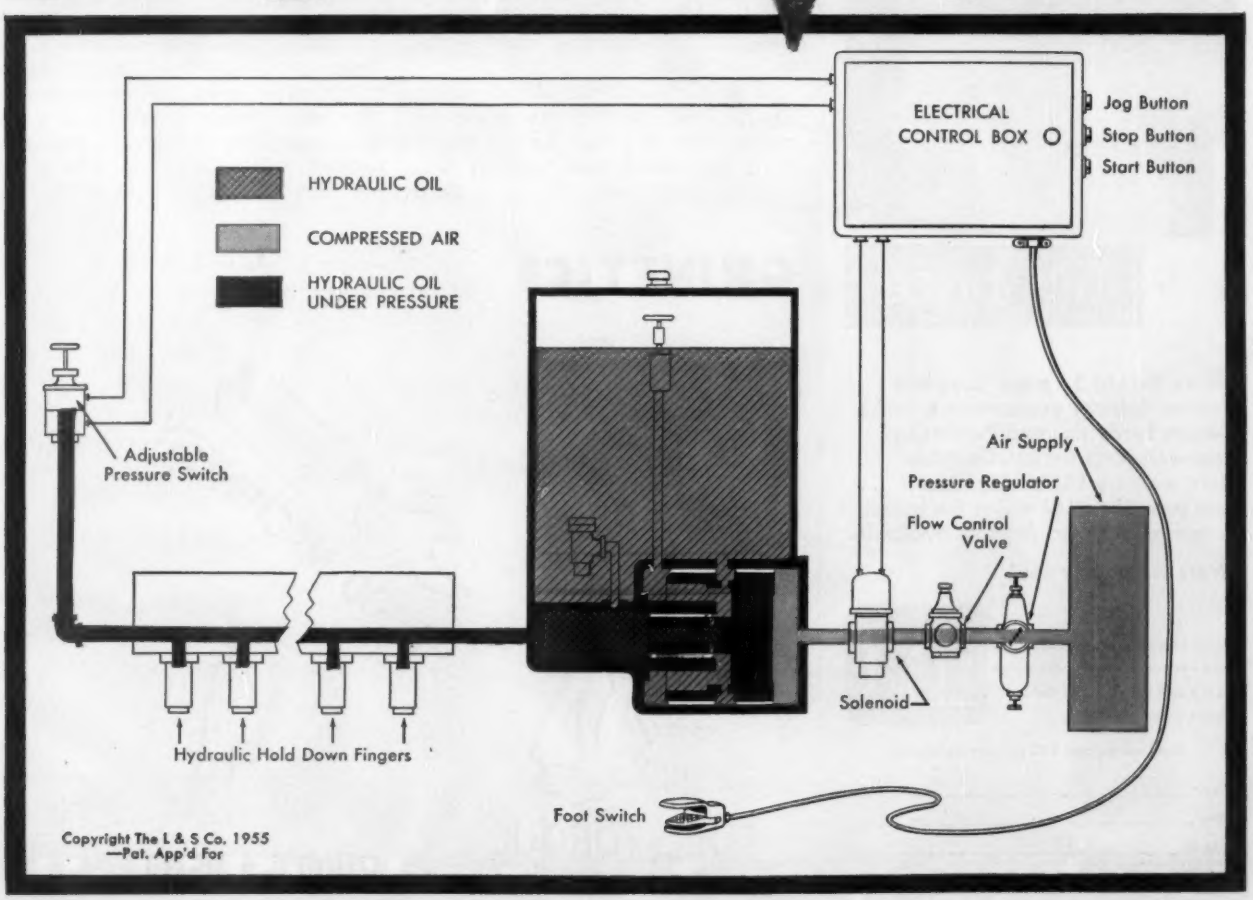
Hamilton Division
Hamilton 2, Ohio

NOW . . . and exclusively from Lodge & Shipley . . . you can choose a shear with a holddown system perfectly suited to your shearing requirements.

"THE SOFT TOUCH WITH TERRIFIC HOLDING POWER"

There's no impact, no damage, no noise, when the holddown lightly touches, then . . .

Tons of holding pressure are developed, before the blade starts to cut!

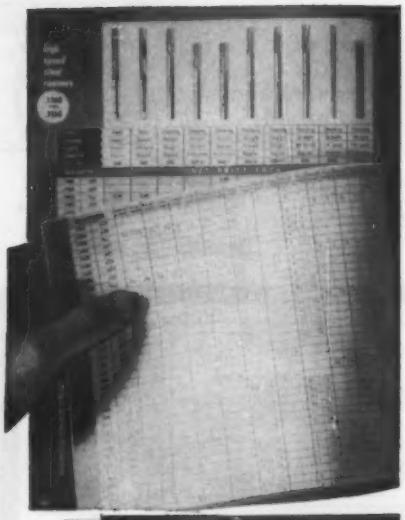


new

the one and only HANDBOOK for REAMER SELECTION

by style

by dimensions



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Here's the L&I 36 page Complete Reamer Selector guaranteed to make Design, Production and Purchasing Engineers jump for joy. Complete data on every L&I quality reamer . . . and remember, L&I makes the widest range of standard reamers available.

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Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Who Gets the Dough?

This letter is inspired by your article on the amazing new Plymouth plant (*AM*—Aug 15 '55, p88). It is certainly an outstanding example of the way automatic production is taking over in modern plants. However, it emphasizes a point that has puzzled me more and more during the past few years since mechanization really got into its stride.

The cry has been "More goods for more people at lower prices." That's a fine slogan, and certainly the new equipment has succeeded in lowering *costs*, but it does not seem to have lowered *prices*. And that's all the ordinary man is interested in. In article after article, you show how companies reduce costs; how a job is now done in two hours that used to take ten. Yet the end result is that the poor consumer pays more for the finished product.

In the "good old days" when Henry Ford startled the world by paying men $5 a day, I could buy a Ford for about $500, and it was literally hand made. Today, a Ford costs about $2500 and it is made almost entirely by machines. Sure, I'm earning more than I did then, but the point is; I could afford to buy a car then—I can't now. Yes, I know labor costs have increased enormously, but there is so little labor involved in the modern car that there should not be a great difference in the total labor cost per car. I know these new machines cost a terrific amount, yet their users brag that they will amortize their cost within a year, so they should not be so big a factor in establishing prices. And I know that materials have increased enormously in price, but that is at least partly offset by the lighter gages of material now used. The old Flivver could be kicked by a mule and hardly show a dent, but you can push in a door panel of a modern car with your thumb. That's a bit exaggerated but you know what I mean.

Labor demands more pay so it can afford to pay the higher prices. Management counters the increased labor cost by reducing the amount of labor required. This should keep things about even. But management then says, "Price of labor has gone up so much that we have to increase prices." This is not true. The price per man-hr may have doubled, but

GRINETICS

By D G SMITH

FULL TORQUE

PILOT LIGHT

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. . . the most **Outstanding Advance** in modern precision surface grinding . . .

PRECISION REID SURFACE GRINDERS

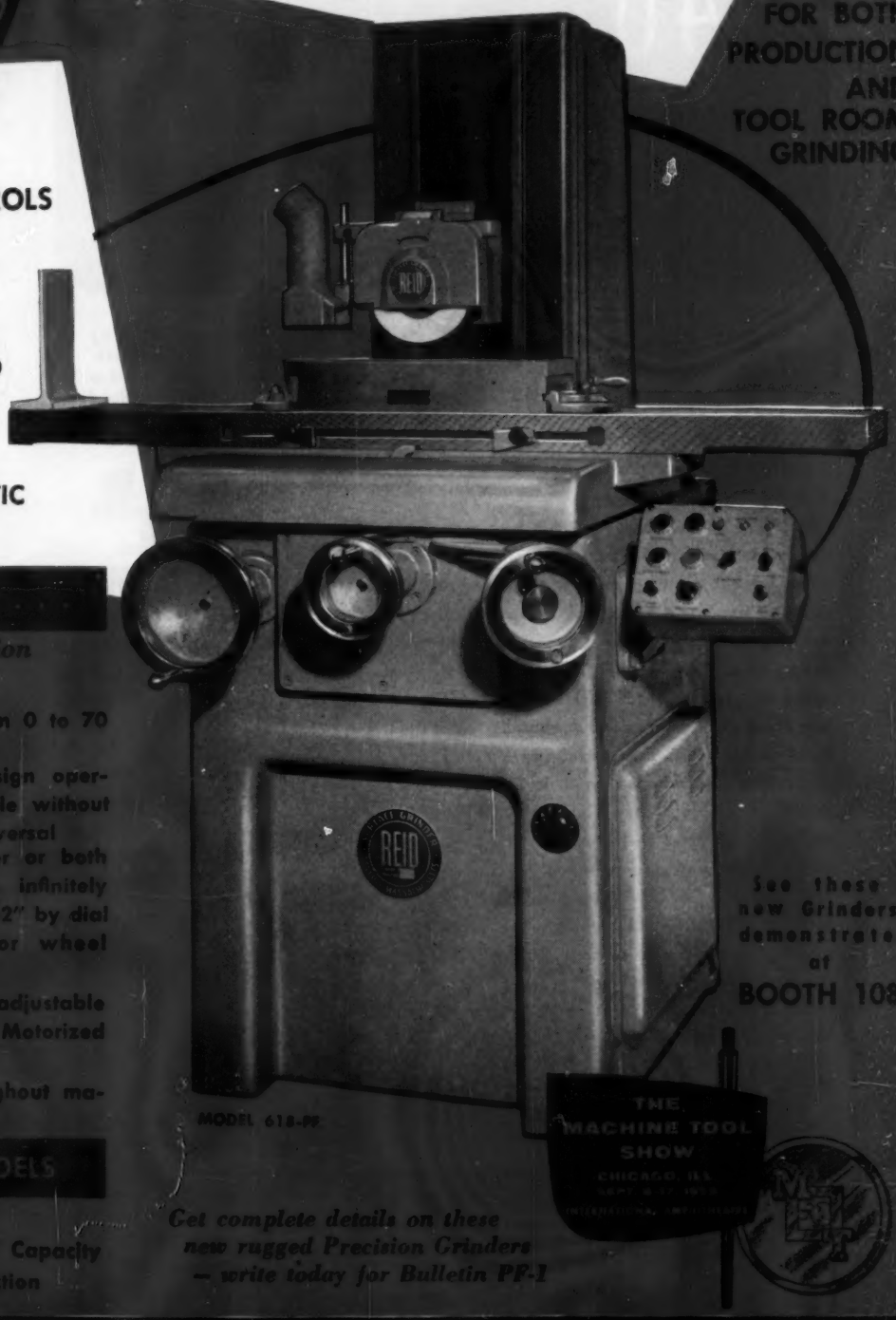
THE NEW — ALL ELECTRIC

6" x 18" Reid-o-matic PRECISION SURFACE GRINDER

FOR BOTH PRODUCTION AND TOOL ROOM GRINDING

with
PUSH BUTTON CONTROLS
for:

- CROSS FEED POWER RAPID TRAVERSE
- RAPID POWER ELEVATING HEAD
- AUTOMATIC CROSS FEED CYCLING
- ADJUSTABLE AUTOMATIC TABLE TRAVEL



MODEL 618-PF

EXCLUSIVE NEW FEATURES . . .

Perfected for True Precision Surface Grinding

TABLE SPEED: infinitely variable from 0 to 70 feet per minute

TABLE TRAVEL REVERSAL: new design operates table without motor reversal

CROSS FEED: instantaneous at either or both ends of table travel, infinitely variable from 0 to 7/32" by dial adjustment (ideal for wheel dressing)

GRINDING HEAD: new design with adjustable gibs — 1 H.P. Motorized Spindle

LUBRICATION: fully automatic throughout machine

PLUS 2 OTHER NEW MODELS

MODEL 618PT — Power Driven Table
MODEL 618HF — Hand Feed 6" x 18" Capacity
full unitized construction

See these new Grinders demonstrated at **BOOTH 108**

Get complete details on these new rugged Precision Grinders — write today for Bulletin PF-1

Reid Brothers Company, Inc.

BEVERLY MASSACHUSETTS

New!

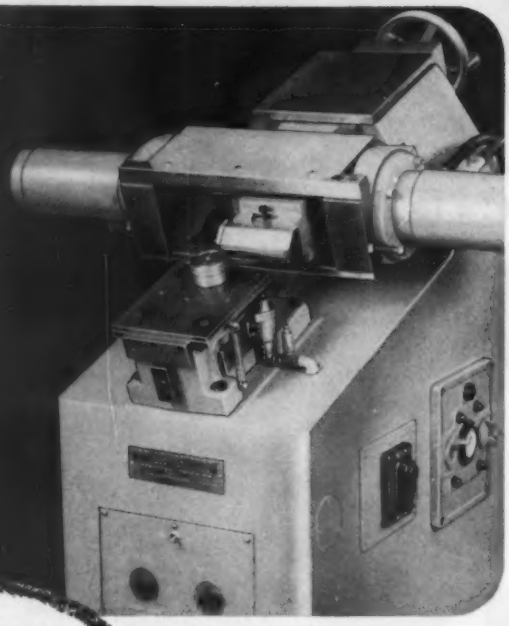
SERIES

46

UNIVERSAL

ROLL-MARKING

MACHINES



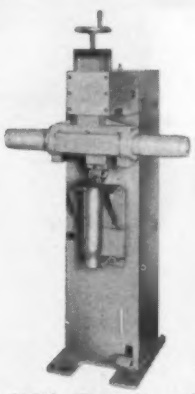
for

✓ **Marking round surfaces**
✓ **Marking flat surfaces**
✓ **Precision graduating**
✓ **Serial numbering**
✓ **Knurling**

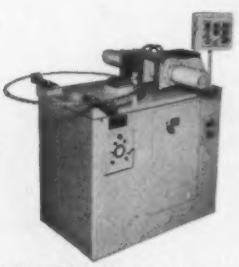
Model 46-354 marks bearing races 1" to 6" in diameter. Cyclomatic Control and air ejection require operator merely to load piece parts.

The NOBLEWEST Series 46 is a truly new concept in universal roll marking. Its *Dual-Function Head* incorporates a pneumatic pressure ram for depth of mark and a pneumatic die slide for roll marking. Combined in one integral unit, this new design offers wide flexibility in *machine design*—and *work capacity*. As illustrated, the *Dual-Function Head* can be mounted horizontally, vertically or at an angle . . . thus permitting a wide range of product application. Like all its famous predecessors, it employs the original NOBLEWEST roll marking process—producing sharp, permanent, sunken impressions—*good for the life of your product*. Whatever your needs for metal marking, NOBLEWEST makes the machines, marking dies and work-holding fixtures for doing the complete job faster, better, at lower cost. Write Noble & Westbrook Manufacturing Company, 17 Westbrook Street, East Hartford 8, Conn.

A few desirable territories open to qualified representatives.



Model 46-382 (Vertical) marks flat surfaces from shell cases to kitchen utensils with equal facility.



Model 46-387 marks large diameter jet engine rings and similar parts.

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EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

if labor is now able to produce twice as many goods per man-hr, then the labor cost per item has not changed.

Steel prices go up, say $2 a ton, and there's maye a ton of steel in a car. But the manufacturer does not increase his price by $2, but by $20 or more, then calmly explains the price increase by saying that steel prices have gone up. Yet it costs him no more to process a ton of $102 steel than a ton of $100 steel.

This whole picture seems to hold true for all branches of the metalworking industry, not for cars alone. The slogan should be changed to "More goods for more people for *more* money."

Geo Heptinstall
Cleveland

We All Make Them

As to my support of the editor's proposal for the final zero (*AM*—May 23 '55, p96), Mr Davenport has presented a point I had not thought about, but should have (*AM*—Aug 29, '55, p122). That final zero will, indeed, lead to trouble, and I believe the editor will agree with this.

I agree that there is no substitute for care. But even the most intelligent and careful people are still people — they are human and occasionally make errors. I have a G & E shaper in my shop, and I am sure it was not designed with a factor of safety of one. Some of the extra "beef" in its design was provided with the thought that normal human errors would be made.

As with shaper operators, so with others. Given the most highly skilled writers, editors, Linotype operators, and proofreaders, the gremlins still operate and mistakes slip by. I should be astonished not to find at least one in the Gov't Printing Office Manual—itself a work on the sinfulness of making mistakes!

A split infinitive, a dangling particle, a misuse of shall and will, or should and would. Such are easily tolerated—easily translated from the vernacular to the language we know. But imagine the quandry of the poor reader, called upon to conceive of a plug of diameter 998 entering a

ring with ID 1.000. All because the operator was bothered with the problem of swatting a fly when he should have dropped in that decimal matrix before the first figure. Mind you, I lay no claim that, had his copy read 0.998 it would insure 100% against error. Human nature and Freud's "psychic errors" preclude that, regardless of precautions.

It's something like safety measures. If punch press operators do this and this, they'll never lose fingers. But it's an if. Some or all occasionally don't follow the rules. Result is, in N man-hr operation, K fingers are lost. A safety device is installed and the same period of operation will result in K – R fingers lost—except that we may now add a few on account of the blokes who get their fingers caught in the safety device, making the net figure K – R + S. And this, even without S, is always greater than zero.

Thus you see that what is proposed in that initial zero is a device to help people be more careful—rather than to permit less care. It is a safety device against normal human error, to improve the chance of getting close to 100% correct.

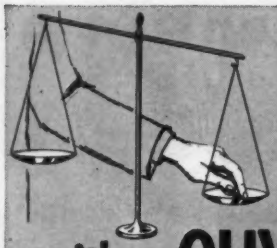
I'm afraid I find no real argument in the reference to being "taught to read a long line at a glance." Some were never taught to. Others haven't the capacity for it. Those who were should be tolerant, because those same zeros may help the lad with the lower IQ to get it straight.

Further, I do not agree that the less ink, the quicker the grasp. Especially with figures, people of moderate intellect must go slow to "get it." They need a lot of talk, or the equivalent in ink, not less.

If the GPO Manual requires writing "one tenth" as .0001 or 0.0001, instead of with the comma, as .000,1 —I think it is silly. For it is in confusion between thousandths and tenths that the greater number of errors occur. When more zeros appear, as 0.00001, or .000001, or .0000001, the poor reader is compelled to count them off, so the chance of error is reduced.

We are concerned with time-costly and money-costly little gremlins —the little bustards that have been at work when the fellow says, "Gee; I thought (sic) it said plus or minus two thousandths. I guess (sic) I didn't see it was two tenths; I'm sure sorry some of them are scrap. Or the other fellow who worked to two tenths when two thousandths would have sufficed, with you-know-what waste of time.

Lew Suverkrop
Bakersfield, Calif



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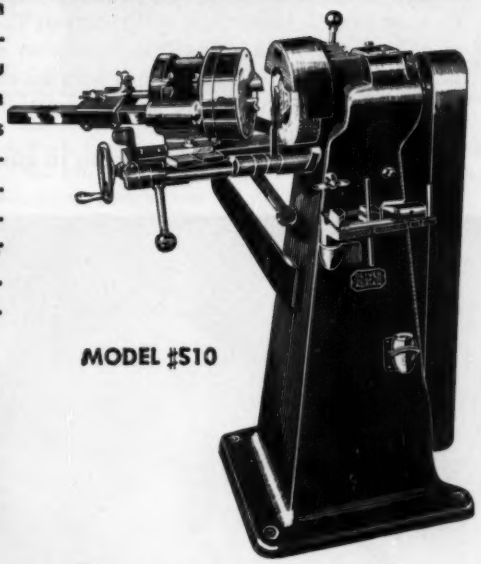

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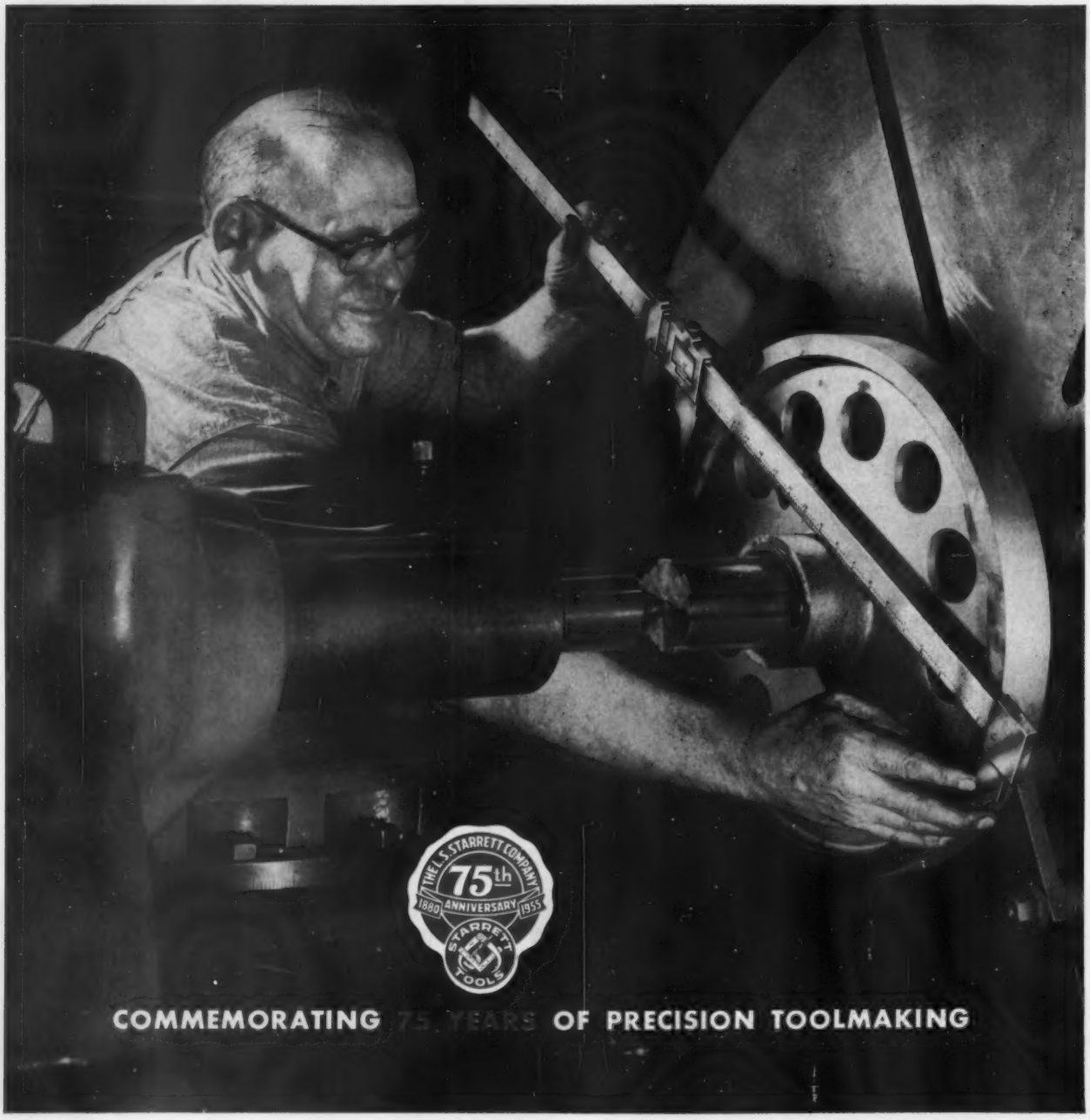
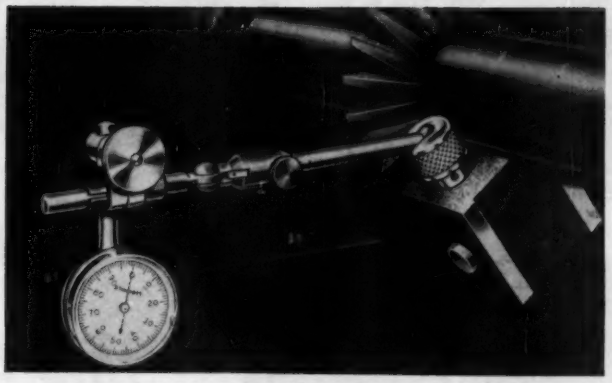


NEW DIAL TEST INDICATORS
like this No. 675 simplify layout, production and inspection operations. Starrett also makes a complete line of high precision-low friction dial indicators.



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No. 657 holds firmly to any iron or steel surface, uses any Starrett "Last Word," No. 196 or No. 25 Series dial indicator. Universally adjustable with on-off push button.

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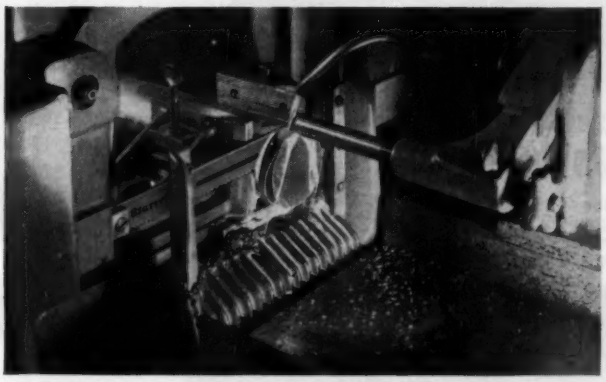
No. 167. Sets of individual gages, each with five gaging surfaces for convex and concave radii, available in six convenient sets. Made of rustproof stainless steel with Satin Finish.



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and Die Stock saves valuable machine and man hours. Available in oil, oil or water, water hardening and air hardening types. "Just lay it out . . . and saw it out."

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Low cost, rugged, easy to install, this new addition to the Danly line is used on dies or in any operation where coil and strip stock must be guided. Hardened parts assure long wear. Packaged complete with mounting screws and dowels.

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Danly's original and most complete line of diemakers' supplies has now been expanded to include the new items being called for by the tool, gage, and die making industry. All items in the line are manufactured to close tolerances and exacting performance standards in sizes to meet your needs . . . all are quickly available from stock at your Danly branch, or through leading industrial distributors everywhere. For complete fast service, for dependable parts, call Danly.

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Spot News of Metalworking . . .

- **One major appliance maker received these inducements** from various U S cities to move out of New York: rent-free, tax-free buildings, special country club privileges for executives, cheap labor, and one town even offered to build a swimming pool and golf course for employees. The answer: No.

- **The government estimates 30% of U S brass mill capacity was knocked out** by flood damage in Connecticut. Branch plants outside the area are working around the clock to make up the deficit. It's expected the defense bottlenecks will come when end-item producers fail to get shipments of brass mill products. (see p115).

Plant of Heald Machine Co, Worcester, Mass, has been acquired for cash by a subsidiary of the Cincinnati Milling Machine Co. Heald's products — precision boring machines, internal grinders, and rotary table surface grinders — will continue to be built and sold by the Heald organization, with Richard A Heald, heretofore president, as board chairman, and Carl F Robey, a vice president and director of Cincinnati Milling, as president. Cincinnati does not build any machines similar in type to Heald products. Heald shipments were $9.7 million in the first six months of 1955. Unfilled orders on August 1 were $11 million.

- **"Building block" electronic brain** developed by a New York firm comes in sections that can be assembled into small units or into extensive control systems for complex automation setups.

Up in Connecticut's flood-damaged Naugatuck Valley there's a brand-new metalworking plant whose sidewalls and roof held while the river raged through it at 50 mph, stuffing it from floor to ceiling with debris. In direct contrast, another plant's built-in-1901 manufacturing building was washed downriver — leaving its concrete-bedded machine tools standing in the open. For an on-the-spot metalworking flood report see p170.

- **They're making "turbo-electric" autos out in Salt Lake City.** Named the "Electronic," the car has a dual-torque electric motor powered by lightweight silver-zinc-peroxide batteries energized by a turbogenerator.

- **Mist cooling for practically all jet-engine manufacturing operations** is being used at Canada's Orenda Engines, where it's replaced CO_2 because it's "cheaper and results are generally better."

- **Sweden's SKF has come up with new linear-motion bearings** in the form of a crossed-roller chain, consisting of cylindrical rollers at 90° to each other forming a chain about 20-in. long. Comes in roller diameters of 6, 9, 15, 18 and 24 mm, is said to meet increased demands on the mobility and rigidity of machine-tool slides.

- **Reclamation of used nuts, bolts, screws and clamps saves $40,000 a month** at the Alameda, Calif, Naval Air Station. Small parts and fittings from all parts of the station are brought to one of the shops, where they are cleaned and sorted for type and size. Then they're inspected, identified, counted, and stored for reissue.

- **Twice as many pearlitic malleable iron castings will be used this year** as last year — 170,000 tons of them according to the Malleable Founders' Society. Upturns in auto, farm implements and rolling stock are the reason.

Modernize Today for Profits Tomorrow

WITH FAST, VERSATILE PRECISION WAY MACHINES

STYLE 58 TWO-WAY: Operates from a single push-button station. Handles large, heavy work. Fixture section can be designed to accommodate the way units from any angle.

Units may be re-arranged around fixture or new fixture sections designed for different operations.

STYLE 54 ONE-WAY: A standard way unit combined with a fixture unit to suit the work. Large, heavy, and awkward parts, loaded in the fixture, remain stationary; the spindles advance to the work.

STYLE 54 THREE-WAY: Standard way units are electrically interlocked to operate simultaneously, or in any sequence. Fast and efficient for machining parts from three directions and holding accurate locations.

STYLE 58 FOUR-WAY: Controlled from a central push-button station. Particularly suitable for machining parts from four directions simultaneously, and performing progressive operations.

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WAY TYPE PRECISION BORING MACHINES ARE PROFIT INSURANCE

Way Machines perform such operations as precision boring, turning and facing. They consist of one or more standard way units combined with a fixture section. Each way unit has its own hydraulic system and controls to operate the spindle slide. Tooling and fixture are added to suit the individual operation. Get details from your Ex-Cell-O representative or write for Way Machine Catalog.

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EX-CELL-O for PRECISION

54-3

Washington . . .

Premiums for broad mobilization base . . .

As part of the plan to develop multiple sources of armament suppliers, the Defense Dept has approved 11 Navy contracts involving price differentials. Total value of the contracts — mostly for electronic gear — is $9.7 million. Of this sum, $1.9 million represents price differentials aimed to put some select firms into production.

Among the companies aided: General Electric, AVCO Manufacturing Corp's Crosley Division, Sangamo Electric Co.

The contracts were let within the past five months. They are the first awards made involving price differentials under the Pentagon's much-celebrated broad-mobilization-base directive issued last December. The order authorized the services to pay premium prices to keep certain firms in military production even though lower bids were offered by other companies. Idea was to keep multiple sources of supply in operation, reduce vulnerability to possible enemy air attack on top-priority industrial plants.

The directive affected procurement of some 970 top-priority hard goods — planes, missiles, guns, and the like which make up the bulk of military hardware buying. In all, the three services have awarded 185 contracts worth $1.2 billion in the past five months for military goods covered by the directive. The Army and Air Force, however, have yet to grant price differentials to develop multiple sources.

Speedup on missiles . . .

The Air Force is speeding up assignment of guided missiles to operational units. A new regulation provides that new missile designs — while still in the research and development stage — will be shoved into operational exercises. Idea is to get a quick reading on how the missile works in the field, how it meshes into operations of strategic, tactical, or defensive units. This will be done before producers start making test quantities of the missile.

Holding down defense spending . . .

The Pentagon is in a tizzy over an alleged administration order to cut federal expenditures 3% in fiscal 1956. The order reportedly comes from Treasury Secretary Humphrey and Budget Director Hughes; everyone seems to know about it. But top Pentagon budget people deny that such an order has been put to them.

Meantime, in the government's budget review of this year's spending — something that's made annually soon after appropriations are voted — no significant change shows up in Defense Dept expenditure estimates. The administration budget submitted to Congress in January showed anticipated fiscal 1956 military spending at $34 billion; the August review shows the same sum.

The only changes are not really program revisions. Major procurement and production expenditures for fiscal 1956 initially came to $12.7 billion, the latest estimate is $153 million less. The Pentagon says the reduced estimate stems only from production slippages, price savings, and the like. On the J-47 jet engine, for instance, performance is much better than first expected. So procurement has been cut by 1600 engines. On foreign military aid, there's a $1 billion reduction in spending estimates. But this comes mainly from reclassification of some military aid into economic assistance, not important program changes. Research and development spending will total $1.3 billion.

New tool pool-order plan . . .

ODM and GSA are setting up a new machine-tool pool-order program for "trigger action" in case of a future emergency. GSA has drafted a standard contract form that would be used in an emergency. The agency has also prepared a full analysis of how the Korean pool-order program worked out. These are being studied by all federal agencies that own machine tools. Eventually, proposed mobilization machine-tool purchasing schedules will be set up.

Administration swing to protectionism? . . .

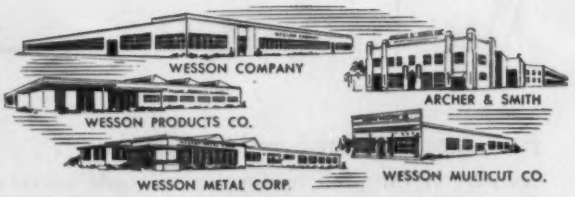
Free-trade advocates are cussing out the administration on what many people consider a defeat of President Eisenhower's liberal trade program. First, came the President's 45% hike in bicycle tariff rates. Then, the Pentagon award of $6.9 million worth of heavy electrical equipment orders to Westinghouse and Pennsylvania Transformer Co. Despite substantially lower bids from an English firm. Most recently, the White House has been considering a selective ban on foreign bids for government contracts. The administration is sensitive to free-traders' criticism, maintains there's been no switch.

New NLRB rules . . .

Some new NLRB rules on labor-management behavior have come out lately. Here's a rundown:

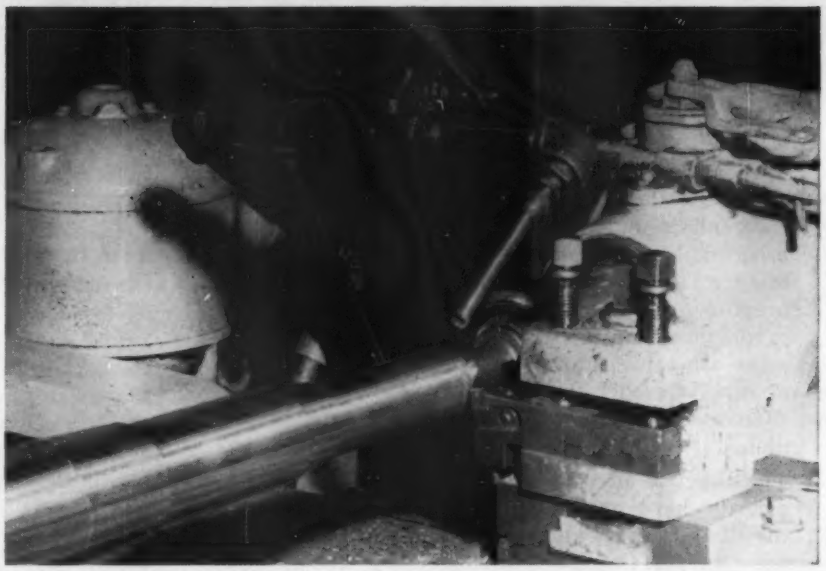
- Unions cannot be penalized for unfair labor practices against their own employees, although the same tactics are prohibited to employers.
- Employers are not required to admit union representatives to their plants to study job duties of members.
- An agreement to arbitrate disputes bars a union from striking, even though the contract does not contain a no-strike clause.
- Unions cannot demand payroll information if they abandon the demand in negotiations.
- Employers cannot insist on a contract calling for a secret ballot among workers before a strike can be called.

carbide NEWS



26 Outperforms Other Carbides 8:1

Boosts sprocket shaft output from 15 to 120 pieces per grind



In a series of production comparison tests, Grade 26 again came out on top—this time in machining forged steel (Rockwell 44) tractor sprocket shafts at a large midwestern tractor company.

With Wessonmetal 26, output averaged 120 pieces per grind as compared with 15 pieces per grind for all other steel cutting grades tested.

The operation is performed on a new 20" Monarch Air Gage Tracer lathe and consists of finish turning the shaft diameter, forming radii and chamfers, and rough turning all other diameters. Length of travel in the cut is 18¼"; speed 375 sfpm; feed range from .009 to .012". Average depth of cut for all diameters is ¼-inch.

Primary reason for the big increase in life achieved with Wessonmetal 26 is its ability to stand up under widely varying conditions. Inserts made of other carbides shattered or broke after 12 to 15 pieces on one cutting edge and could not be indexed. This trouble was eliminated with Grade 26, which averaged 20 pieces per edge and could be indexed to give a total of 120 pieces per grind.

Worthy of note also is that the performance of Wessonmetal 26 (a "nearly universal" steel cutting grade) was achieved in comparison even with carbides of a specialized nature specifically selected for this operation.

New Film Points Way To Better Tooling

One of the most dramatic technical sound films yet produced is now released by the Wesson Company for showings to technical and shop groups.

Built around the development of tooling for an actual job—the machining of tractor track links—the 16 mm. technicolor sound film—which took two years to complete—records the *failures* as well as the successes achieved. The trials and tribulations encountered will remind many of their own experiences.

Entitled "Tools of Abundance," the film tells how a large manufacturing committee working with Wesson tool engineers carried a specific job through to completion. It is the story of how cooperation helps to develop and improve American manufacturing methods.

This story of teamwork—supplemented by about a dozen other general machining and high production operations in the film—provides a rational approach to solving other difficult tooling problems. For a showing to YOUR company, write for the film on your company letterhead. A Wesson man will bring it to you.

tools Wesson carbide Wessonmetal

WESSON COMPANY
DEPT. AD
1220 Woodward Heights Blvd.
Detroit 20, Michigan

Tool Hints

If you have an idea that you would like to get better tool life on a job than you are getting, do these things and you may find you were right:

1. Check for vibration and chatter and eliminate all you can. Both are deadly to tool life.

2. Check whether the rake angles are correctly ground. There is a best combination for any job.

3. Check whether you have the ideal combination of speed and feed.

4. Check whether tools are changed before they get too dull. Dull tools wear faster than sharp ones. Keeping them at work is false economy.

5. Check tool after each sharpening against the tool PRINT. This is excellent insurance.

None of these suggestions are new. But they are still keys to better tool performance.

(P.S.—A sixth method is to call in a Wesson man)

Detroit . . .

When CIO Auto Workers bargainers . . .

ended a 110-day strike against Chrysler Corp in 1950, they commented bitterly on the "arrogant corporation's" attitude. Chrysler had held out on the matter of pension funding. Unionists felt the company was without a leg in the dispute. When settlement was achieved, the customary handshakes and congratulatory words were missing. Walter Reuther's team was hopping mad.

That bitterly concluded contract expired at midnight on Sept 1, and minutes later, union bargainers were heard to chant in vengeful manner: "Chrysler is a horse thief!" Chrysler bargainers listened briefly, then stalked out. Six hours later, both parties sat down together, announced the terms of a new three-year contract, and feebly assured one another that they had arrived at a "new era in labor relations." Terms of the contract patterned closely after the Ford pact except that under the Chrysler supplemental pay plan, a separate fund of about $3.1 million was set up for about 8000 salaried employees represented by the UAW. The Chrysler trust fund for hourly workers eventually will total about $49 million. Special pay boosts for about 13,000 skilled workers ran generally higher, too, ranging from 8 to 38 cents an hour.

The union claimed victory, also, in that it shortened the duration of the contract. Had it run precisely three years, it would have terminated Sept 1, 1958. Instead, it expires on June 1 of that year, the same day the Ford contract ends, and only three days after General Motors' contract runs out.

Did that mean that the union was working toward industry-wide bargaining? Not in the least, according to Emil Mazey, UAW secretary-treasurer and director of the union's Chrysler Body Division. He does not, he said, favor bargaining on that basis.

What the May 29 and June 1 termination dates do mean, of course, is that the union will have greater leeway in 1958 in selecting a target for initial demands. Without admitting it publicly, Chrysler was content to agree to the new expiration date. For one thing, it has not relished its bargaining position behind Ford and GM. Any settlement either of those companies makes necessarily must at least be duplicated — if not exceeded — by Chrysler.

Moreover, the corporation was in no mood to engage in what might have become a major hassle over the issue of expiration dates. Notwithstanding the statements that the outlook for more pleasant labor relations is in prospect for Chrysler, the sentiments of one union bargainer seemed at this early stage to suggest a wait-and-see attitude. An hour after the contract had expired, the unionist said: "I can't figure what's wrong with this corporation. They did this in 1948 (referring to a 17-day strike) and in 1950, and now again in 1955. I've been mad at the old lady before," he added, "but hell, I never set a match to the house." The "fire" at Chrysler, of course, lasted only briefly. But resentment stemming from bitter negotiations before, particularly at Briggs Manufacturing Co (now Chrysler's Auto Body Division) is still smouldering.

"As safe and as snug . . .

as a seed in an apple" is one slugline Ford will use to ballyhoo its auto safety program in 1956. The new concept, according to the company, is to limit injuries by "packaging the passenger." To package him snugly, Ford will make the following safety features available (some standard equipment, others at extra cost to the motorist who wants to be well packaged): a deep-center safety steering wheel which collapses slowly under impact (crash injury studies are reported to show that 40% of all injured drivers are hurt on the steering assembly); stronger latches to hold doors in place under impact; seat belts; cushioning for the instrument panel and sun visors (38% of injuries are reported to be caused by impact with the panel); and a rear view mirror with a special adhesive to help keep the glass from shattering (4% of all injuries to front seat passengers are received on the mirror).

The figures come from Cornell University's Automotive Crash Injury Research Project. Ford and Chrysler, both of which are applying Cornell's findings in their product planning, have each granted $200,000 to the university to finance further studies.

Record changeover for Ford . . .

One of the fastest model changeovers in its history is expected by Ford. The company figures that most of its Rouge plant employees will work throughout the entire changeover without any loss of time at all. Maximum lost time on any operation will not exceed two weeks.

Downtime in the engine and foundry divisions was held to three days. Major factor in helping the company confine lost time to the bare minimum: The '56 Ford involves little design change.

Plymouth is Grateful . . .

to its vendors for helping get its new Mound Road V-8 engine plant into operation just 11 months after initial machine tool and equipment orders were placed. Normal lead-time was cut 40-50%.

In mid August, Plymouth was turning out 60 engines per hour. By November 1, the rate will be up to 150 an hour. Upping Plymouth's yearly new car output to 835,000 a year. This figure will include some overtime operations.

5346

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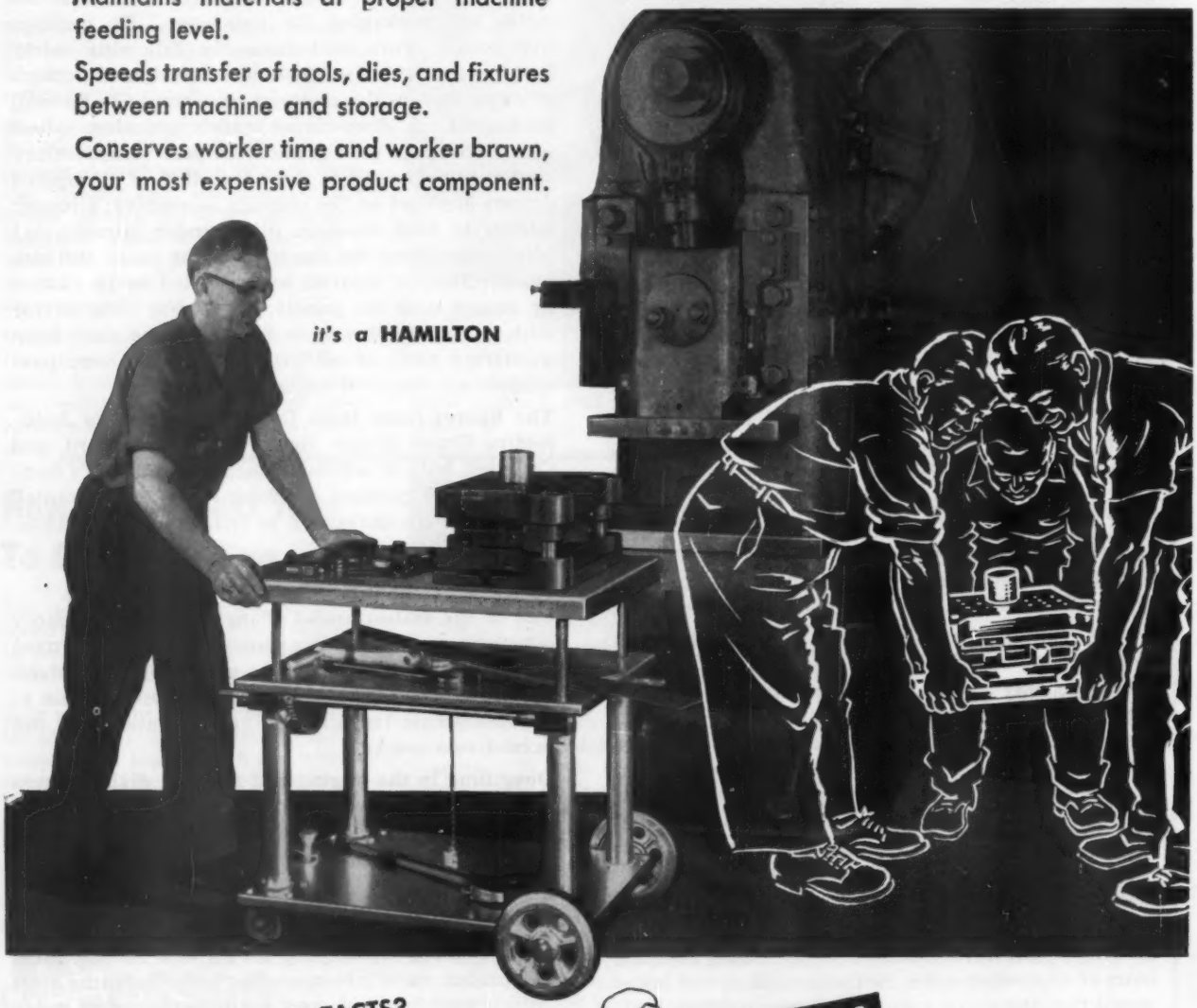

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Machine Tools . . .

$66 million of big machines to be ordered . . .

The reserve machine tool program for production of turbines and turbine gears for ship propulsion has at last been given the green light by ODM director Arthur S Flemming.

About $66 million will be spent with around a dozen builders for long-lead-time machine tools, including 200-inch gear hobbers.

The machines will be set up ready for operation in the plants of: Allis-Chalmers, DeLaval Steam Turbine, Elliott Co, Falk Corp, Farrell-Birmingham, General Electric, Newport News Shipbuilding and Westinghouse.

Actual placing of orders probably won't come for several months. First off, the Navy and BDSA are to make a final check of the machines to be bought.

Then GSA will survey the inventory of government-owned tools to see whether any machines "without mobilization assignments" could be used.

After that, the companies involved will order the machines, GSA financing them. GSA will arrange for storage and maintenance while they are "on standby."

Before putting the machines to work, the eight companies would be required to lease or buy the machines.

Dr Flemming's approval of the turbine project came on the heels of a unanimous recommendation in its favor by ODM's Borrowing Authority Review Board.

Once before, the board had split 2-2 in voting on the project.

Pentagon approves tool rentals to Allison . . .

Rental of some $5 million of idle Army Ordnance-owned machine tools and other production equipment to Allison Division of General Motors for non-defense work has been approved by the Defense Department.

ODM must give its blessing to the plan, however, before it takes effect.

The equipment is installed in Allison's Indianapolis plants for production of cross-drive transmissions and spare parts for combat vehicles.

Bulk of the machines would be rented for a short time until they can be replaced with new tools. Some machines, however, would go into Allison's model shop and research and development laboratory on a long-term lease.

This is the second time that Allison has tried to lease government tools for non-defense use. The first request, for only 25 machines worth $394,000, was turned down because there was no assurance that the entire line would be maintained as a "production package." Apparently Allison now is asking to lease an entire line, or most of the tools in a line.

At last count, ODM had authorized lease of 553 tools worth $3.8 million to 14 companies for non-defense use. Altogether, 68 leasing proposals involving 130 pieces of equipment worth $16.6 million have been put up to ODM for decision.

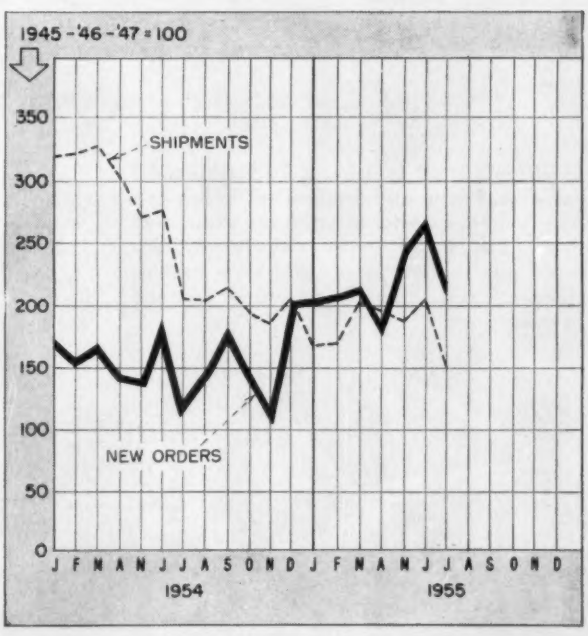
Flooded shops can rent government tools . . .

Rental of idle government machines to crippled metalworking plants in the flood-damaged northeastern area of the country has been authorized by ODM.

Leasing will run only for the time needed to replace or repair company facilities.

Military contractors in the flooded districts wishing to rent government tools should apply to the nearest military procurement agency. Other firms should contact the Business and Defense Services Administration, Department of Commerce, Washington. Monthly rental rate will be 1% of the tool's acquisition cost, plus shipping and installation charges.

Some 50-odd duplex milling machines for the Air Force are to be procured in Italy, according to reports. Actual contract for the machines was awarded to a California company. It, in turn, is reported getting the machines from Italian builders.



TWO FACTORS MAY ACCOUNT FOR THE SHARP DIP between June and July's new orders and shipment on the National Machine Tool Builders Association Index — June was the month when the Air Force released tremendous orders for machine tools, and July is usually the month for plantwide vacations. New orders dropped from 263.2 in June to 215.9 in July: shipments from 198.8 to 151.6

SNYDER SEGMENTED AUTOMATION in 91 station, 182 operation, in-line transfer machine features four segments which can operate independently or as a unit to assure continuous production of automotive automatic transmission cases at 100 cases an hour at 80% efficiency

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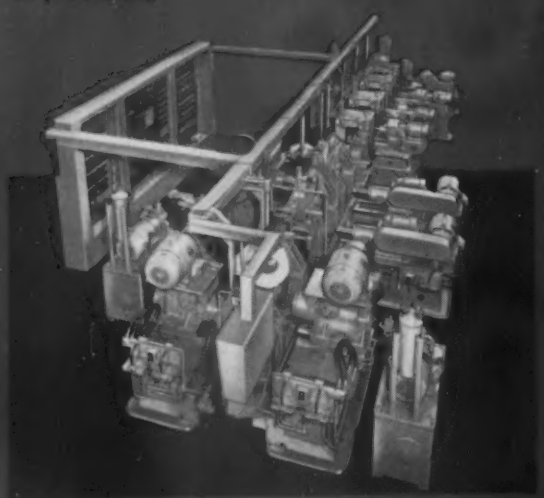
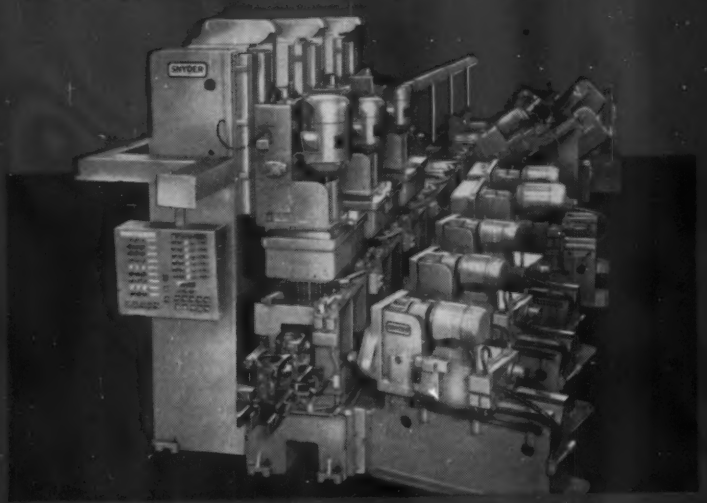
SEGMENT 1: 40 feet long, 19 stations, 10 spindles. Part manually loaded, both ends face milled, counterbored, three diameters rough and finish bored and faced, two pads side milled, pump pad face milled, clearance slot milled. Part tilted 90 degrees in processing.

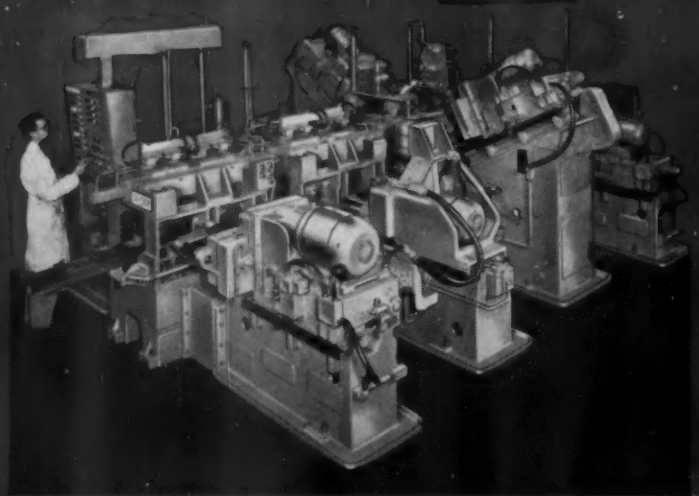


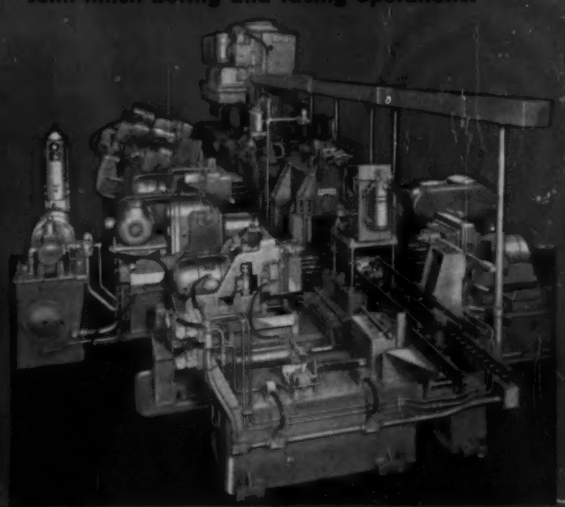
SEGMENT 2: 47 feet long, 31 stations, 91 spindles. In top face, end and at angular locations inside, 51 holes are drilled, countersunk, semi-finish and finish reamed, spotfaced, tapped. Part is tilted 90 degrees and rotated.

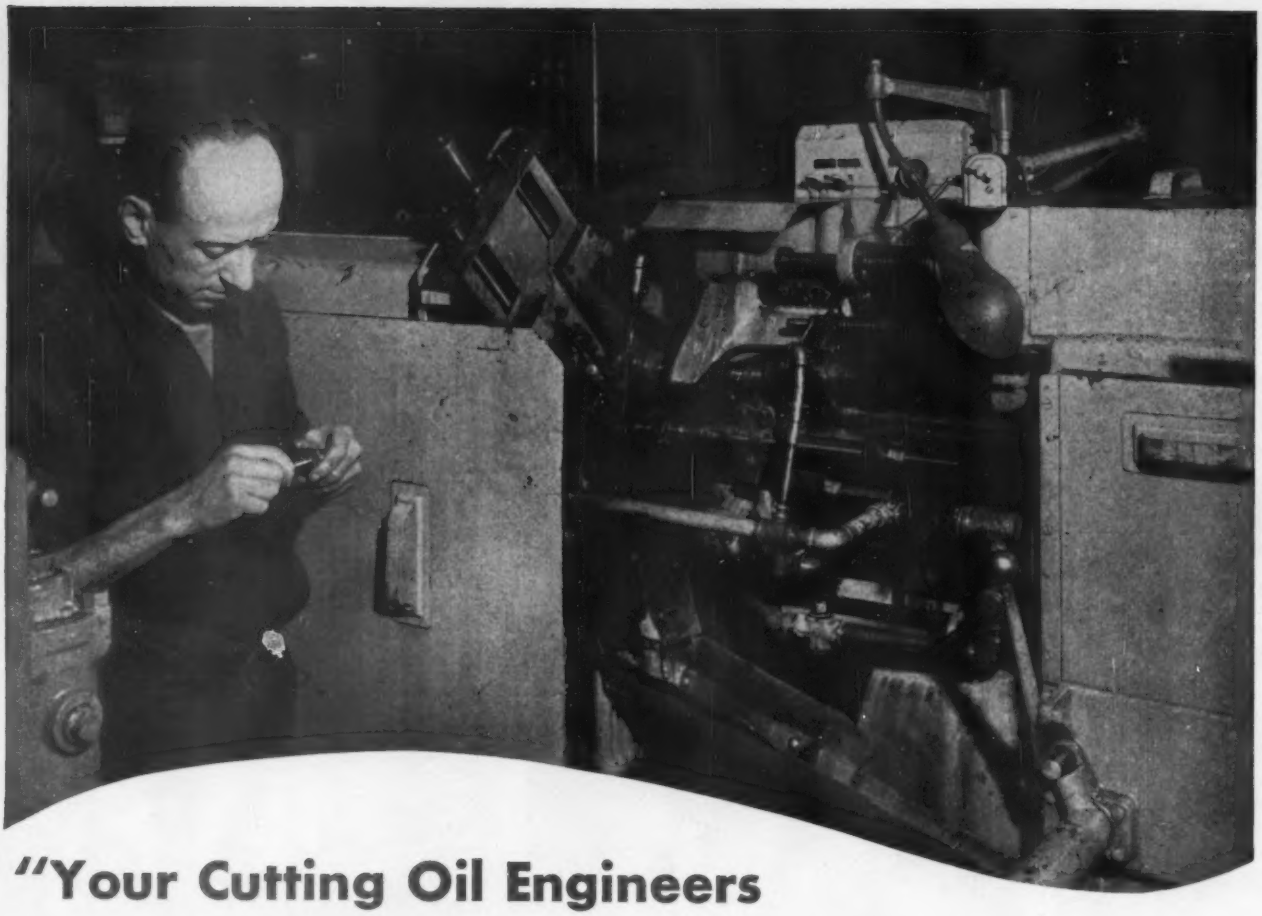


SEGMENT 3: 26 feet long, 17 stations, 21 spindles. Various drilling, chamfering, tapping, counterboring, reaming, spotfacing operations in both case sides. Part removed from transfer bar to special fixture and tipped 45 degrees to process angular inside hole, returned to transfer bar, turned 90 degrees, tilted 90 degrees to bring pump face up.

SEGMENT 4: 36 feet long, 24 stations, 60 spindles. Various drilling, chamfering, tapping, semi-finish boring and facing operations.







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—reports Kennedy Automatic Products Co., Marshall, Michigan

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"Your cutting oil engineers know their way around a job shop. Their recommendations for the proper oil to use and the proper way to use it have been invaluable in helping us to solve our many machining problems. Thanks to them we have been able to do most of our work with Texaco Cleartex Oil, which does an outstanding job as both cutting fluid and machine lubricant for our automatics. Texaco Cleartex Oil gives us good tool life and excellent finish."

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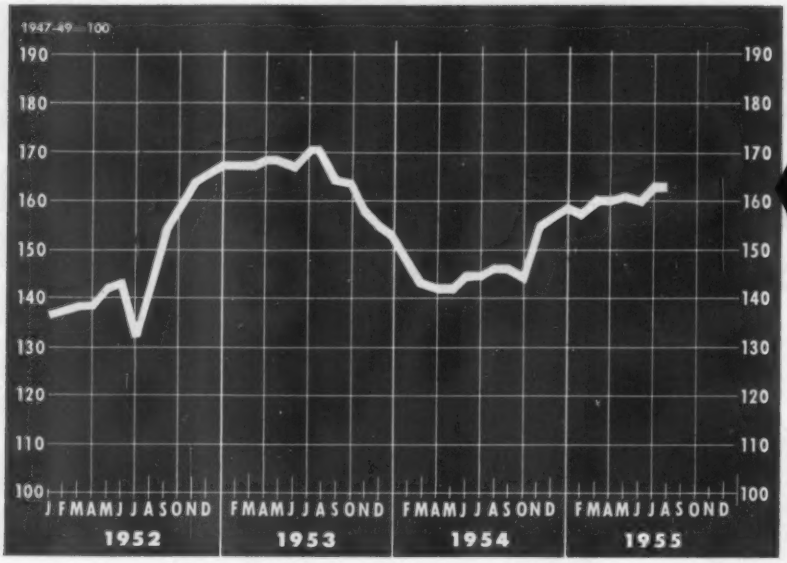
Gaging Metalworking . . .



Production Index

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	AUG. Estimated	JULY Preliminary	JUNE Revised	JULY Year Ago
Total index	**163**	**165**	**163**	**148**
Machinery	**138**	**136**	**123**	
Electrical Machinery	**190**	**187**	**173**	
Autos	**145**	**143**	**102**	
Other Transportation	**286**	**286**	**284**	
Other Metalworking	**138**	**138**	**125**	

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

Crest of the boom?

A few warning signals have appeared to indicate that Metalworking is about at the crest of the boom and that future movement of the production curve may be a bit downward rather than up.

The new order index of industrial supplies and machinery dipped 13% in July. This index measures the volume of orders received by American Supply and Machinery Manufacturers' Association members from industrial distributor firms, which in turn supply the manufacturing industries.

The commercial stamping industry experienced a 25-to-30 percent drop. The biggest loss was automotive business.

Nevertheless, U S industrial output continues to reach new peaks every month.

Retooling at Detroit has resulted in a slackening of 15-to-20 percent in parts production. The decline was felt first in July and the lower volume will hold through September.

Full-capacity operations, however, are predicted for the fourth quarter.

No real break in prosperity anticipated . . .

Despite the dip in several metalworking lines, the final four months of the year are not expected to bring any serious break in prosperity in Metalworking as a whole.

American Machinist Production Index still is clinging to a level within 10 points or less of the Korean war peak.

Rehabilitation of metalworking plants in the flood-damaged New England areas, as well as the very tight emergency situation in the brass industry as an aftermath of the flood, already has made certain steel items harder to get and has threatened to interrupt operations of fabricators dependent upon brass.

Government sources estimate that 30% of the nation's brass mill capacity was knocked out by the recent floods. Some operations at these mills are undamaged, needed only power to get going.

Others may take months to get back into operation. Even sound estimates of the damage may take several weeks to prepare.

What about flooded-out brass capacity?

Copper & Brass Research Association has made an extensive survey of its flood-damaged member companies. Here's what they plan to do:

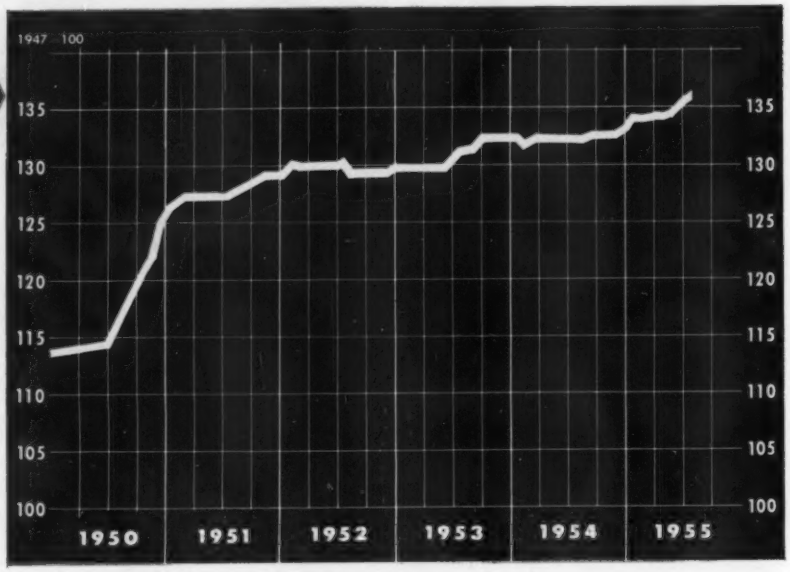
- **Extensively damaged Plume & Atwood Mfg Co,** Thomaston, Conn, will stay in business, despite rumors to the contrary.
- **American Brass Co,** Waterbury, Torrington and Ansonia, Conn, is partially operating now, will be in full operation by November 1.
- **Chase Brass & Copper Co,** Waterbury, is stepping up Cleveland output to around-the-clock operation to offset flood losses. No estimate when Waterbury will be back in full operation.
- **New Haven Copper Co,** Seymour, Conn, has cleanup and rehabilitation "proceding on schedule."
- **Phosphor Bronze Corp,** Seymour, will be in full operation by October 1.
- **Scovill Mfg Co** suffered little damage to its main plants in Waterbury, but can't estimate when its hard-hit Waterville Division, also in Waterbury, will be back in operation.

New defense orders requiring copper and brass will get top priority. This will back up civilian work.

Gaging Business . . .

Price Index

	AUG. Estimated	JULY Preliminary	JUNE Revised	JULY Year Ago
Total Index	**136.0**	**135.5**	**135.0**	**132.5**
Metalworking Machinery	**153.0**	**152.0**		**141.6**
Other Machinery exc. Electrical	**139.9**	**139.7**		**137.5**
Electrical Machinery	**132.0**	**131.7**		**131.1**
Fabricated Metal Products	**131.0**	**130.8**		**128.7**



AMERICAN MACHINIST INDEX OF METALWORKING PRICES

Near-record gain in inventories . . .

Latest figures on business inventories show a gain of $600 million in a single month.

That much expansion, on an annual basis, would come to $7 billion. Only in four previous years has this rate been exceeded. And those years were extraordinary — 1941, 1946 (when war-starved stocks had to be replenished), 1950 and 1951 (Korea).

There is no assurance that this exceptional rate will keep up. It is believed, in fact, to have slowed down.

Inventory-accumulation rate disturbing . . .

The rate at which inventories are being added to, nevertheless, is disturbing for these reasons:

1) Buying for stock competes with buying on the part of the consumer. During a strong business upswing, such as we have been in, when some goods are in short supply, this can mean inflation.

2) Accumulation of too much inventory inevitably bring its own correction. Orders fall off, production is cut below current buying levels, and a general business recession can result.

The upswing in inventories since the first of the year has been mostly in durable goods at both the retail level ($700 million increase) and among manufacturers ($300 million).

Inventory increases in nondurable goods have been less than half those of durable goods.

The big gains actually have been in dealers' stocks of automobiles and in stocks of steel in the hands of users.

Judged by past standards, the present level of inventories does not appear to be dangerously high.

Most of the increase thus far has been in wholesaling and retailing, which are now back roughly to their 1953 peaks. Manufacturing inventories are still well below former peak levels.

Inventories in relation to sales, regarded as a fundamental test, do not appear too high.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949 = 100)*	140.2	141.0	122.6
Steel ingot operations (thousands of tons)	2,264	2,186	1,525
Electric power output (million Kilowatt hours)	10,906	10,812	9,227
Production of automobiles and trucks	152,729	165,094	113,496
Engineering construction awards (*Eng. News-Record* — millions)	$330.3	$265.3	$376.7

QUARTERLY BUSINESS INDICATORS

	Latest Quarter	Preceding Quarter	Year Ago
Gross National Product (billions)	$384.8	$375.3	$357.6
Expenditures of new plant and equipment (millions)	$28.83	$27.86	$25.65
Profits after taxes in primary iron and steel industry (millions)	$ 262	$ 230	$ 167
Profits after taxes electrical machinery industry (millions)	$ 167	$ 203	$ 173
Profits after taxes machinery (except electrical) (millions)	$ 224	$ 175	$ 229
Profits after taxes in motor vehicles and parts industry (millions)	$ 501	$ 275	$ 291
Motors and generators new orders index (1947-1949 = 100)	157.0	156.7	152.4

*Seasonally adjusted

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one of six special 8″ throat Underfeed Clinchors used by a large automotive body manufacturer. Feeds and sets square cased nuts in outside quarter panels, left and right hand.

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T-J RIVITORS automatically feed and set solid rivets with high production. Electrically powered Rivitor sets solid steel rivets up to ⅞″ long. Air-powered sets aluminum alloy rivets or steel rivets up to ¾″ long. Throat depths 8″ to 36″.

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Metal Goods Corporation

CONNECTICUT
Hartford
The Am. Steel & Aluminum Corp.
Peter A. Frasse & Co., Inc.

GEORGIA
Atlanta
J. M. Tull Metal & Supply Co.

ILLINOIS
Chicago
Central Steel & Wire Co.
Chicago Steel Service Co.

KANSAS
Wichita
Metal Goods Corporation

LOUISIANA
New Orleans
Metal Goods Corporation

MAINE
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Brown-Wales Company

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Lyndhurst, N. J.
Peter A. Frasse & Co., Inc.
Union, N. J.
Mapes & Sprowl Steel Co.

NORTH CAROLINA
Charlotte
Edgcomb Steel Company

OHIO
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Central Steel & Wire Co.
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Viking Steel Company
Columbus
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OKLAHOMA
Tulsa
Metal Goods Corporation

OREGON
Portland
Electric Steel Foundry Co.

PENNSYLVANIA
Philadelphia
Edgcomb Steel Company
Peter A. Frasse & Co., Inc.
Pittsburgh
Follansbee Metals Corporation
York
Edgcomb Steel Company

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Automation Is Not Just Talk

Automation is not just a lot of talk. Something is really being done about it.

It is not a patented technique belonging exclusively to the big boys—the Fords, the Chryslers, the General Motors and the General Electrics. It is actually being used by the rank-and-file of metalworking shops, regardless of size.

That is the interesting fact established by a survey of 1574 companies made by AMERICAN MACHINIST editors and reported in detail in our issue of August 29.

Some 22% of the reporting companies of all sizes and varieties have installed some kind of "continuous automatic production," which is a good simple definition of automation.

The bigger companies have gone farther than the little ones, as you might expect. More than one-half of the manufacturers employing 1000 workers or over have adopted some form of automation.

As you might *not* expect, at least one-tenth of the small shops with less than 50 men have taken up automation.

The most common use of automation is for loading and unloading machines automatically. The next most popular use is for transferring work between machines. Automatic assembly is high up on the list too—higher than we would have guessed.

The most compelling reason for automating is to reduce the direct-labor cost—and that certainly is no surprise. Increased production is almost as important a reason, however. A desire to improve the quality of the product is a third reason.

On the employment side, the survey confirmed the widely held belief that an automated plant requires a larger and more highly skilled maintenance crew. It also tends to increase the engineering and toolroom forces.

There is no doubt, however, that it cuts down sharply the number of production workers needed. Fewer production men produce more goods by far with automation than without it.

The evidence turned up by the survey proves conclusively that automation is on the march. It is not confined to the mammoth robot-operated factories pictured in popular fancy any more than America is confined within the borders of New York City.

It extends to the medium sized plants and down into the small shops. It knows no bounds by industry, geography, type of product, or scale of operation.

Most impressive of all, metalworking managements by the thousands are pouring out money day by day, and week by week, to apply continuous automatic production at the local plant, and even departmental, level, to the immediate production problems at hand.

This is the logical and healthy way in which the use of automation in one form or another is widening at prairie-fire speed. It is catching on so fast because it slashes direct-labor costs, boosts production, and adds to quality of product.

If by chance you have pushed automation to one side, the time is right for you to bring it out and examine carefully what it can do for you.

Of this you can be sure: Metalworking production techniques of the future will be inextricably bound up with automation. The sooner you key your program to that fact, the better.

Burnham Finney

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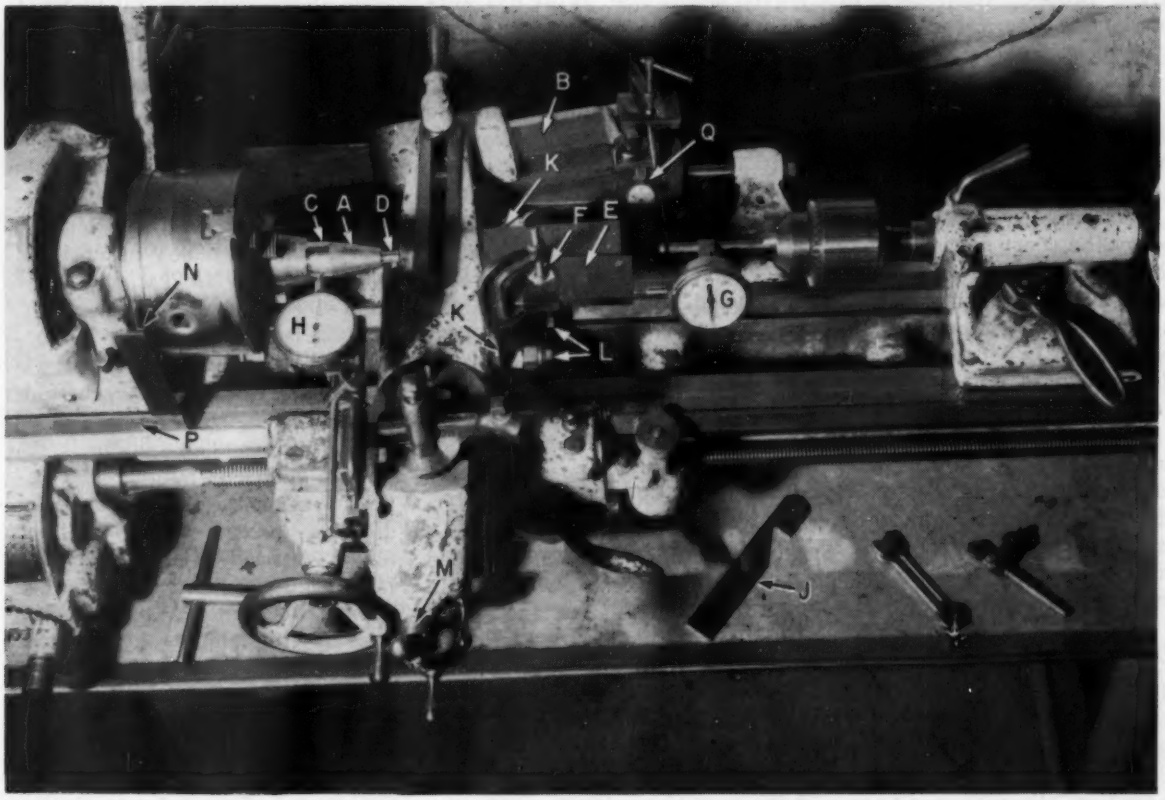


How to set accurate tapers on lathes

Generating an accurate taper on a lathe takes know-how. To some people the technique is not new; to many others it will be a revelation. Tapers with close tolerances are a frequent shop headache. Here is one way to ease the pain, plus a suggestion for checking leadscrews. Also note the new use of commas to simplify reading decimal numbers

LEW SUVERKROP, president, SUVERKROP INSTRUMENTS, BAKERSFIELD, CALIF

The photograph illustrates a method useful in generating an accurate taper on the lathe, and gives a hint of the accuracy obtainable with an ordinary machine tool. Master *A* is used as a guide for setting taper attachment *B*. This prototype has two accurate and finely finished cylindrical collars *C* and *D*, each about ½ in. long and separated from the other by about 2 in., measured along the prototype. The prototype surface between the collars is merely roughed out at an angle somewhat greater than the desired taper. Collar diameters are generated to the nearest 0.000,1 in. and, having consideration for distance between measuring points on them, their difference conforms to the desired taper in inches per inch of length. When taper is expressed as an angle in degrees, $D = 2\ L(\tan \frac{1}{2}A)$ where *D* is difference in collar diameters; *L* is the distance through which the carriage will be moved in testing the implied taper; and *A* is the included angle in degrees.

The setup shown was necessary for a taper gage with an included angle of 20° 00′, with a tolerance of ± 0° 02′. In this case, tan ½ (20° 00′) = 10° 00′ = 0.17633 from the trig table. Therefore the difference between collar diameters is 2 × 2 × 0.17633 = 0.705,3 in. After roughing out the prototype collars to approximate size, the smaller one was finished by grinding and found to have a diameter of 0.413,6 in. The larger

collar was then ground to a diameter of 0.412, + 0.705,3 = 1.118,9 in.

In the process, movement of the carriage is determined by a 2-in. gage block *E* between a 1-in. gage block *F* attached to the carriage and a 0.001-in. dial indicator *G* held in a chuck in the tailstock. The surface of the 1-in. block which serves as a base is squared with the lathe axis. The gage blocks are supported by the short piece of angle iron *K* attached to the carriage by means of the follow-rest screws *L*. The top of the angle iron was machined sufficiently flat to serve as a rest for the blocks, without significant error. In attaching the angle iron, it was adjusted with its upper surface within ½° of parallel with the lathe axis. Because cos ½° = 0.99996, this insures sufficiently precise movement of the carriage according to the 2.000,0-in. length of the gage block.

POSITIVE CONTACT

A 0.000,1-in. dial indicator *H* is supported by the toolpost, with its plunger perpendicular to the lathe axis. In addition, a fixed gage *J* made for this lathe was used to insure indicator *H* contacting the collars precisely in the horizontal plane passing through the axis of the lathe. Both indicators *H* and *G* were mounted so plunger travel is in the horizontal plane of the lathe.

Headstock spindle bearings should be adjusted, if necessary, to put them in the condition desired when using the taper attachment later in closest tolerance work. The taper attachment should be checked for straight-line movement within desired tolerance. Then it is clamped in position so the movement of its slide will be confined to the central part of the guide. The tailstock is withdrawn to the right, and the carriage is moved to the right limit of the taper attachment. This is done to eliminate backlash in moving the carriage to the left, before getting to the position where indicator *H* may contact the smaller collar at about its middle. The tailstock is brought up so indicator *G* contacts the 1-in. block and is brought to zero.

Indicator *H* is moved in and brought to zero. Carriage or compound micrometer collar *M* is read. This is recorded and indicator *H* is withdrawn. The carriage is then moved nearly 2 in. to the left, sufficiently so that the 2-in. block may be slipped into place. Movement of the carriage is then continued to the left until indicator *G* comes to zero. Indicator *H* is again advanced until it zeros on the larger collar, when micrometer collar *M* is read. If the two micrometer-collar readings are the same, the taper attachment is correctly set. If not, it is readjusted and the process is repeated, and checked. A third indicator *Q*, clamped to the guide of the taper attachment and indicating on the lathe bed, is of help in minute readjustment.

INHERENT ACCURACY

We found that the micrometer collars on this lathe could be read with a limit of error well within 0.000,2 in. Error in carriage screws is not pertinent because the reading is taken at one point on the screw. Indicator *G* and *H* were found to repeat well within 0.000,5 and 0.000,05 in., respectively. This, coupled with the accuracy of the 2-in. gage block (from a set purchased as having 4 millionths tolerance per inch of length or 0.000,008 in. in the 2-in. block), indicates that the carriage movement was within 0.000,1 in. of 2 in. The trig table shows the tangent of angles at 10° 00′ to increase and decrease by 0.00030 per 0° 01′, which in a 2-in. distance is equivalent to 0.000,6-in. radius or 0.001,2-in. dia. The micrometer used for measuring prototype collars is insulated; has been checked with blocks, and these collars are measured immediately one after the other when the temperature of the prototype has become stable throughout, all indicating that the difference in collar diameters is determined to the nearest 0.000,1 in. From these facts, even making allowance for a known, very slight waviness in direction of carriage travel, and assuming all the mentioned limits of error operated fully to give a maximum error in the resulting taper setting, we concluded that the setting could be relied on as correct well within the required tolerance.

After the taper attachment was set, it was drilled and reamed for two tapered-pin dowels, one at each end, as this is a taper we use with some frequency. Fit of taper pins was checked with bearing blue. Then the taper attachment was moved from its adjustment and reset according to the tapered pins, to check the repeating reliability of setting by these pins. It was found to be within tolerance. Incidentally, this attachment has similarly been adjusted and fitted for our commonly used tapers of 3° 00′, No. 9 B&S, and No. 3 Morse.

DETERMINE ERROR

To check the leadscrew, the half nuts are engaged on a known thread setting. The spindle is rotated a sufficient number of rotations to move the carriage an exact distance measured as outlined above. A scribe mark *N* through layout blue on the chuck, matched against the square *P* as an index, is used. The amount by which the lathe errs in nominal leadscrew travel is indicated by measuring, along the circumference of the chuck, the distance from the index of scale *P* to the final position of the mark *N*. This distance, divided by the whole circumference of the chuck and multiplied by the nominal pitch for which the lathe is geared, gives the error in inches.

Wear in the leadscrew ordinarily introduces no significant error for the reason that there will be insignificant local change in helix angle. It should be kept in mind, however, that this method indicates *combined* error of leadscrew *and* gear train, and that these may be either cumulative or compensating. Therefore, gear-train error would have to be considered in order to determine leadscrew error alone. If the leadscrew can be turned and indexed by a gear mounted directly upon it as in a "loose change" lathe, this is easy—for points along the screw, spaced one or more pitch distances apart. But our interest in leadscrew accuracy usually is confined to its ability to cut accurate threads on a particular lathe. This means that we are usually interested in the combined accuracy of screw and gears.

It is interesting that those extraordinary "precision lathes" used

for chasing extremely accurate threads are always the loose-change design.

There are only a few of these scattered through the world, such as those of David Mann in Lincoln, Mass, and those in such institutions as the National Physical Laboratory at Teddington, England. But in these special lathes, the "change gears" are never changed in the manner of ordinary lathes. In some cases the gears are not changed at all; a lathe may be reserved exclusively for chasing screws of only one pitch. Moreover, instead of half nuts, a solid nut is generally used, always engaged with the lead-screw. And this is a *compensating* nut, held against longitudinal movement in the lathe carriage, but rotatable about its axis and oscillated by a lever fixed to it. This lever is moved by a sinuous cam fixed to and extending along the lathe bed. As the carriage moves along, this oscillates the nut to compensate for minute errors in lead found in the lathe screw (which itself had been generated by the most accurate means available), combined with errors in the "change gears" (also of maximum available accuracy).

FIND TRUE AXIS

Returning to the main subject, the question arises as to how the true axis of a lathe may be determined. In this connection, the gage shown at *J* in the photograph is of particular value in taper work. It is used in setting the correct height of the cutting-tool edge where it generates the taper surface. In grinding, it is used to set the height of the grinding-attachment spindle axis. (Incidentally, if there is significant wear in the lathe ways, great care should be taken to set the height precisely for that location along the lathe where the smallest diameter of the taper will be generated. There the surface of the taper curves most rapidly away from the point of contact, so that a given error in height causes the greatest error in generating the taper.)

This gage is of hardened and tempered steel, about ⅛ in. thick. It has a notch, one face of which is parallel with one end of the gage. The distance from this face to the end of the gage is precisely the height of the horizontal plane of the lathe above the front flat way. By *horizontal* is meant that plane which is parallel to direction of movement of the lathe tool in running the carriage along the lathe, and in moving the cross slide on the carriage.

To determine this distance precisely, it is necessary to insure that the top surface of the compound is close to parallel with that horizontal plane. If a rigidly supported dial indicator, with its plunger applied to the upper surface of the compound, "zeros" for *any* movement *and* angular position of the compound on the lathe, then the required parallelism exists. (In this, the indicator's allowable variation depends on the form, dimensions, and tolerances required in the work to be produced by the lathe). This means that the indicator will thus "zero" when (1) the carriage is moved along the bed, when (2) the cross slide is moved on the carriage, and when (3) the slide of the compound is moved along its guide—all for any angular position of the compound on the cross slide. If significant error is found, then the compound is removed and the upper surface of the cross slide is similarly tested.

To be correct, this must "zero" when the carriage is moved along the bed and when the cross slide is moved on the carriage. If the error is in the compound, it is corrected by making (1) the bottom surface of the compound guide and (2) the top surface of the compound slide, each parallel to the mating horizontal surfaces of the compound guide and slide. When new, most lathes, including some inexpensive ones, meet these requirements.

USE A COLLAR

To determine the distance required for the gage, a cylindrical collar is finish-turned on a piece of steel chucked in the lathe. If there is any question regarding wear in the ways, this collar should be positioned along the lathe at the point where the smallest diameter of the taper will be generated. The distance from the under side of the collar to the top of the compound is measured, as may be done with a feeler gage and micrometer. This distance is added to one-half the diameter of the collar, determined by micrometer, giving the height of the axis above the compound. Then the height of the compound above the front way is measured. For this, one may use an accurate straight edge or parallel, in contact with and overhanging the upper surface of the compound, and an inside micrometer. Adding these two heights gives the height of the horizontal plane of the lathe above the flat way. This is the dimension required for the gage; and a tool set properly to this gage dimension will precisely contact the lathe axis.

SIMPLE CHECK

So much for the precise determination of the gage distance. The condition of the lathe's spindle and ways, and the nature of the work required, may not warrant the trouble. In this event, the gage dimension may be approximated empirically by adjusting a finely pointed tool so that it faces the work at what is visually estimated to be the axis of rotation. This tool is mounted so as to overhang the carriage. After adjusting it as stated, the tool is withdrawn to a position above the flat way when its height above that way is directly measured by any suitable means. This method may also be used as a rough check before making the gage according to the more precise determination described. Incidentally, an added convenience is a second gage, showing the height of the lathe axis above the carriage cross-slide.

"I think now would be the time to ask for a raise . . . he's smoking those 50-cent cigars again . . ."

HOW TO MAKE WORK HABIT-FORMING

Laziness and other bad habits are not inborn. Employees can be lead out of them, but they can't be driven or threatened. Here are some quick pointers on a common problem

GEORGE S ODIORNE, associate extension specialist, RUTGERS UNIVERSITY

John Jones, employee, is habitually lazy, his output is low, or he constantly makes mistakes. He isn't nearly as good an employee from the company view as Bill Smith who works diligently all day . . . We find similar individual differences between foremen, superintendents, salesmen, and even company presidents. One supervisor always orders materials on time, always has his reports done correctly, and conducts thorough safety inspections. His colleague in the next department has to work overtime to keep up. What is the nature of the work-cycle, routine, system or procedure that makes one person more useful than the other?

One of the contributions of scientific management has been the theorem that management skill is not hereditary, but can be learned. We also know that workers are not immune to improvement. Fat men are not destined by implacable fate to remain obese all of their lives, nor are slothful or unproductive workers marked from birth for lesser effectiveness than their fellows. It is a costly mistake to manage them with such a tacit assumption. A more constructive approach is to consider these qualities which seem undesirable, as work habits which are subject to modification, elimination, or replacement through training.

In considering the work habits of employees along these lines, some changes in attitude are required on the part of management. The first is a firm resolution not to lapse into traditional thinking about workers with traits of slothfulness, laxity, or carelessness. It is easy to become sore over a Lazy Lout, or Irresponsible Kid. Far easier for example, than analyzing his productive efforts as a product of his work habits, then considering these work habits as subject to change through intelligent understanding and effort.

Psychology can explain many motivational factors which lead to a particular overt form of behavior. From the practical management view it is more convenient to classify much of the behavior of an employee on the job as "Work Habit." Furthermore, such a rule-of-thumb classification has the advantage of practicality, and is refreshingly free of complicated, background information. It is primarily job performance which interests management, and it is in this area that some practical results can be achieved with the problem employee through knowledge of work habits, their nature and control.

Naturally, such matters as the employee's health, mental capacity, dexterity, agility, and other innate or fixed qualities cannot be overlooked. It would be senseless to try to improve the volume of output of an employee with a heart condition or a serious physical handicap simply by making more demands upon these limited capacities. Nevertheless, for the majority of employees, careful attention to work habits can increase effectiveness on the job, and often increase satisfaction and sense of adequacy from it.

The Nature of Work Habits

"I can't figure out why he doesn't do it the right way. I've told him and told him. He's just pig-headed, I guess." The speaker was a group leader in a machine shop. He might have been any supervisor who was attempting to deal with long-established work habits. Methods men, training directors, and supervisors at all levels run afoul of this most persistent of phenomena in the area of governing the actions of people in their work. Some pragmatic rules for understanding and controlling the work habit are:

1 . . PEOPLE TEND TO FORM PATTERNS OF WORK BEHAVIOR: Both simple and complicated jobs will settle into repetitive patterns. This pattern may be of the worker's own devising, or it may be taught. Once acquired it is adhered to quite religiously. This patern is characteristic of complex jobs such as clerical or supervisory positions as well as manual jobs. The latter are often called procedures.

2 . . THESE WORK HABITS ARE PERSISTENT: Once a series of steps in performing a job have become habitual with the employee they persist with irrational tenacity. Unless some strong influence is brought to bear, the content of the work pattern or procedure will not be critically examined by the employee. In the day-to-day mechanics of his job, the average

person will follow the repetitive cycle in a more or less unthinking manner. Far from being undesirable, this is a necessary quality of human behavior. Were this attribute of behavior not possible, our lives would consist of a series of deliberations and decisions, about such things as walking, chewing, writing, and other routine and repetitive actions.

3..WORK HABITS ARE FORMED BY FIRST EXPERIENCES: The major source of work habits is the early experience of the person on the job. Occasionally this means the very first time that the person performs the routine. When this first cycle is a casually arrived-at one through the worker's own trials or observations, it may or may not be the most effective way. Good training dictates that the proper method be taught at the very first attempt, and corrections made at that time. At this early juncture, it is the whole cycle of habits that is being taught. Later, corrections must deal with specific actions, and will be more difficult to alter.

4..THE GROUP TENDS TO AFFECT WORK HABITS: In the job situation, individuals tend to be "other-directed" in the manner in which they perform their jobs. By looking to left and right, and listening to advice and criticism of old hands, they will make changes in their work habits more readily in many cases than from a word from their boss. This need for group acceptance is an influence on the general nature of the work habits of all the members. Workers who might be inclined to work until the quitting bell will quit five minutes early if everyone else in their section does so. Supervisors will conform to general practice also. As one plant supervisor put it:

"I'd like to tighten up on people being absent but I can't really put the screws on until the rest of the foremen tighten up too. It's kind of a general practice to take it easy on absentees, so why should I be different?"

5..LAZINESS IS A HABIT: Although psychologists have paid scant attention to the anatomy of laziness, as it affects job performance, laziness can be considered as habitual. Discounting such factors as some serious physical disability, when a worker has a persistent inability to concentrate on his work for protracted periods of time, or lacks the attitudinal qualities for sustained effort, this can be considered as an aspect of his work habits. Treated in this light, it can be subjected to remedial action by management in a manner similar to other unsatisfactory work habits. As one supervisor put it:

"I don't get mad at the lazy one. I start working on getting him into habits that include filling his present idle and observation time. Saves a lot of wear and tear on my nerves, and gets better results.

6..WORKERS REFLECT WORK HABITS FROM THE BOSS' EXAMPLE: Recently I was walking through a plant with the manager. The feature of the plant was its impeccable housekeeping. A small piece of string lay beside the aisle. The manager immediately pounced upon it and carried it to a receptacle.

"I couldn't afford to walk by anything on the floor like that. I've got to set a good example, because if I don't demonstrate that I've got habits of good housekeeping, I can't expect the rest of the people to have them either."

There are some managers who can command perfect records on absenteeism and tardiness although they are frequently an hour or two late themselves, or off on hunting trips or golfing. These are the exception, however.

Work habits of supervision have a way of transmitting themselves to the entire organization. Coupled with genuine interest in the progress and manner of performance of the worker, it has an especially strong effect on general work habits such as continued effort and thoroughness, and reflects itself in such factors as quality, safety, spoilage, output.

7..TRAINING CLASSES ALONE WON'T CHANGE WORK HABITS: It is part of our folklore that education can solve all of our problems, but too narrow a construction of this as regards work habits can be a mistake. A class in foremanship doesn't make a foreman. One of the cardinal problems of every training director is to get the material which is taught into use. Although coaching on a personal basis has some advantages over classes, it is no automatic solution to the problem of changing work habits. This is especially true of the type of coaching which is nagging, picayunish, and negative in nature. The cycle of the bad work habit is left unchanged, or made stronger by poorly conducted training.

8..THE BEST WAY TO BREAK A BAD WORK HABIT IS REPLACE IT: This does not mean replace the worker, but rather to break the cycle which adds up to an undesirable pattern by supplanting the undesirable with the desirable. It is axiomatic in work simplification and methods improvement that new methods of work are more readily accepted when related to some new device or rearrangement of the work place. A further axiom is that the new method is more readily accepted if the worker participates in shaping it. This technique is applicable in other situations where an undesirable work habit more extensive than a simple method in scope has developed and requires changing.

Here's What to Do:

It is paradoxically true that while workers resist change, they also enjoy variety and novelty. As a technique of practical supervision, the control and utilization of work habits is a valuable tool. A practical program for improving employee effectiveness through analysis and improvement of work habits might go along these lines:

1. Study existing work habits.
2. Identify areas where improvements might be made.
3. Plan a program of supplanting the poor work habit with a better one.
4. Train employee in the new method, procedure, or technique. Explain advantages fully, and solicit suggestions and participation in the change.
5. Follow up for relapses, and make corrections early. This means that you prevent formation of new habit patterns which are both undesirable and difficult to change, once established.

Chromium carbide requires special flux for silver brazing

Refractory oxides formed during heating must be dissolved if the chromium carbide is to be wetted for a satisfactory bond to steel. A boron-containing flux gives stronger joints, resistant to higher temperatures

C R BENSON, Cemented Carbide Products Engrg, CARBOLOY DEPT, GE
and E S CHAMER, metallurgist, HANDY & HARMAN

The problem of finding a satisfactory method for joining cemented chromium carbide has been answered by development of a technique using silver-alloy brazing. The key to this technique is a flux—containing metallic boron—that provides improved fluxing of oxides of refractory metals and promotes good wetting action by the brazing alloy. This development may pave the way for increased use of chromium carbide in applications in the 600 F range, where the material could not be utilized heretofore for lack of a suitable joining method.

NEW FIELDS OPENED

A representative chromium carbide is Carboloy grade 608 which is nonmagnetic and has a density and coefficient of thermal expansion similar to that of steel and hardness comparable to heat-treated steel. Such properties fill many requirements for service in chemical and food equipment, valve parts, extrusion nozzles, gage blocks, high-speed instrument bearings, and numerous high-temperature applications.

Previous attempts to join chromium carbide have been only moderately successful. Epoxy-resin cements can join Carboloy grade 608 to itself, to steel, or to glass, but joints have shear strengths in the 5000 to 7000 psi range and are not applicable for uses above 200 to 300 F. Attempts to weld or braze the carbide have caused minute cracks around the braze line.

In previous attempts with silver-alloy brazing, good wetting of chromium carbide has been obtained on the as-sintered surfaces by brazing in an atmosphere of pure, dry, hydrogen or with an alloy of 85% silver and 15% manganese. However, these techniques require special equipment and are applicable only on a limited basis. Moreover, they do not answer the need for a method of joining surfaces from which the high-nickel, sintered face had been ground off. Chromium carbide forms a film of chromium oxide at brazing temperature. General-purpose flux is not capable of reducing or undercutting this oxide film to any appreciable extent.

Further work led to a combination of powdered boron and general-purpose flux. Boron, being a strong oxide former, probably reduces chromium oxide and apparently increases the capacity of flux to absorb oxides.

GOOD WETTING ACTION

The boron-containing flux, now available as a standard product called Special Handy-Flux B-1, dissolves the chrome-oxide film and promotes good wetting and bonding between chromium carbide and silver-brazing alloys.

It was also found that to secure good wetting, Carboloy grade 608 chromium carbide, in common with other refractory, difficult-to-wet materials, must be heated to about 1400 F (unless the flow point of the alloy requires a higher temperature).

The brazing procedure is:

1. Sandblast the chromium carbide and steel surfaces to be joined.

2. Clean these surfaces with a suitable solvent, such as carbon tetrachloride. Flux the pieces with Type B-1 flux.

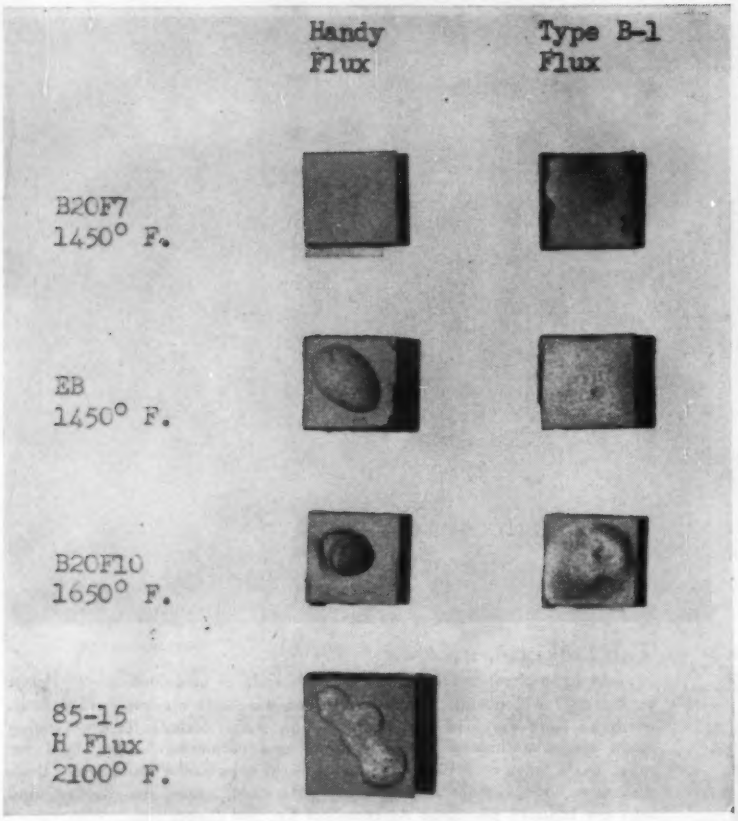
3. Assemble the pieces in a jig or workholder, preplacing the brazing alloy in the joint. Apply additional flux to restore the continuous coating if necessary. Note: Types EB, SS-5 or Easy-Flo alloys may be used.

TINNING MAY BE NEEDED

In some cases when brazing chromium carbide to steel, it may be necessary to tin the surface of the chromium carbide with brazing alloy as a preliminary step. In such cases, the carbide should be heated on the surface opposite the tinning surface, using a reducing flame. The joint should be brought up to a temperature just exceeding the flow point of the brazing alloy as rapidly as possible, but care must be taken to prevent localized overheating of the flux.

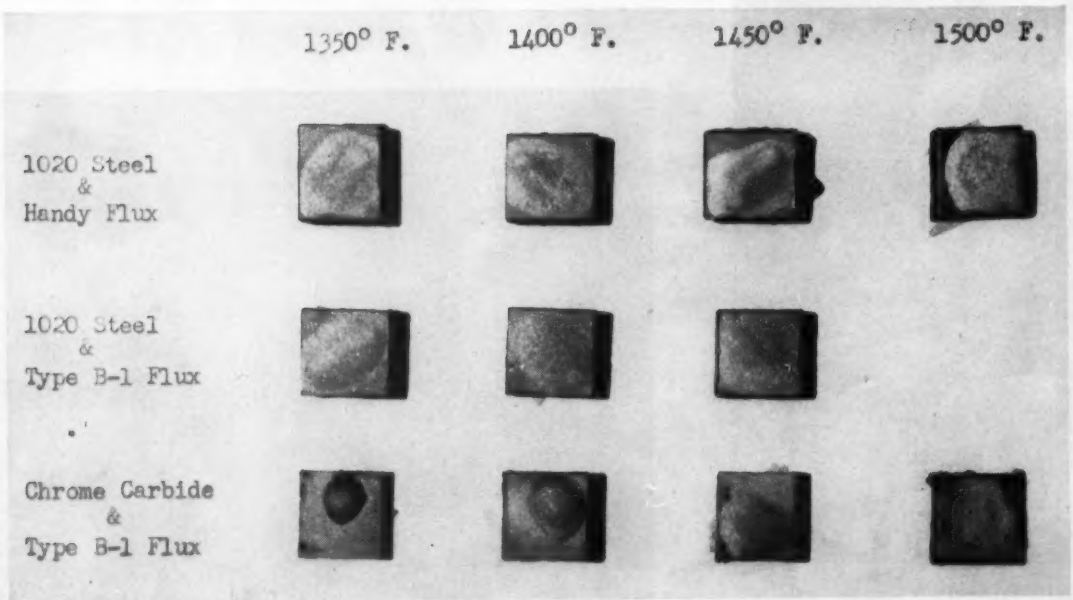
4. Heat the joint to about 1400 F, or 100 F above the flow point of the brazing alloy, whichever is higher. When torch heating is used, a slightly reducing flame must be used. Apply the flame to the steel part of the assembly. If necessary to apply the flame directly to the chromium carbide, to prevent local overheating of the flux.

5. The chromium carbide should, if possible, be "puddled," or moved around slightly, when brazing temperature is reached, to help eliminate entrapped pockets of gases or flux. The assembly should of course be realigned before the heat is removed.



COMPARATIVE WETTING ABILITY of general-purpose flux and Type B-1 boron-containing flux on chromium carbide. The best combination appears to be Type B-1 flux, which dissolves chromium oxide, and EB brazing alloy, which contains manganese, a strong deoxidizer. For comparison, note the results with a silver-manganese alloy and special high-temperature flux, lower left

SUPERHEATING (to 1450-1500 F) is required to obtain good wetting of chromium carbide. The B-20F7 alloy contains no manganese, which leaves the deoxidation task exclusively to the Type B-1 flux. Lower brazing temperatures are satisfactory for wetting steel



ALLOY DESIGNATION

CARBOLOY	HANDY & HARMAN	COMPOSITION, %							MELT TEMP, F	FLOW TEMP, F
		Ag	Cu	Zn	Ni	Cd	Sn	Mn		
B20F7	Easy-Flo #3	50	15.5	15.5	3	16			1170	1270
B20F10	SS-5	40	30	25	5				1240	1560
(EB)	EB	57	33				7	3	1120	1345
(85-15)	85-15	85						15	1745	1760

SHOP SHOTS

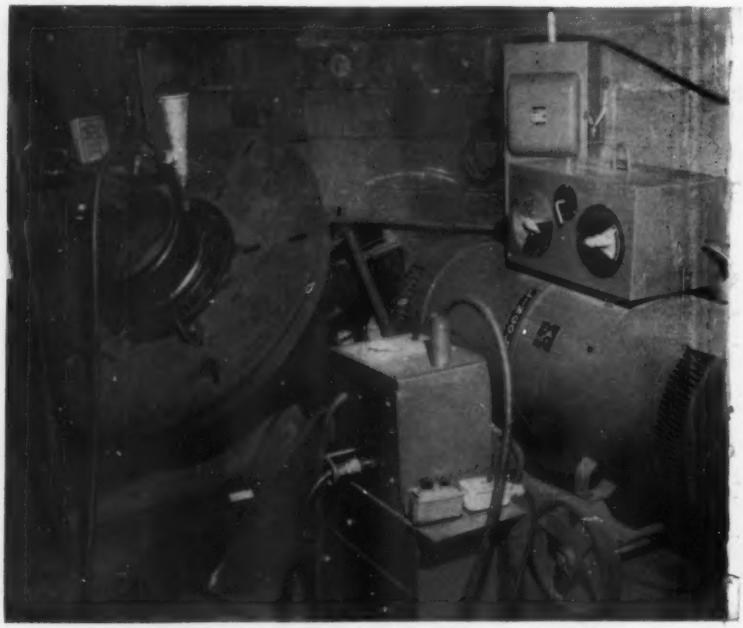
at Ryan,
Noland,
Minneapolis-Honeywell,
Monarch,
Signode Steel Stamping

Tab tackers . . .

. . . add scrap sheet-metal squares to both ends of unwelded tubular joints so the tabs will absorb notching effect as the parts are arc-welded later. Machines were designed and built in Ryan shops; include Heliarc welding torch, electro-mechanical control system, and automatic hopper feed for tabs. Cycle takes only 10 sec, against several minutes for hand work. Units also tack weld without adding tabs. Afterward, seams are welded, and tabs are trimmed off. *Ryan Aeronautical Co, San Diego, Calif.*

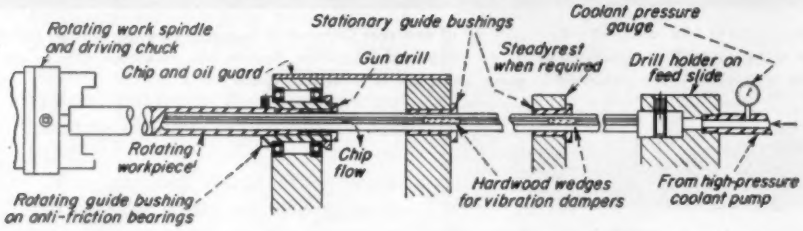
Toroidal coil winder . . .

. . . produces potentiometer elements for aircraft control systems to new high accuracy, eliminating insulation requirements. Wire is 0.0002 in. in dia, spaced 0.0001 in. apart. Bobbin is circular ring, held by steel fingers that automatically release, retract to clear shuttle carriage as it moves around the circle, and reclamp again when shuttle is past. Shuttle rotates as it interlocks bobbin, laying wire in toroid (doughnut shape). Coil is removed by releasing fingers, unlocking split in shuttle, and pulling out bobbin. Winder, built by Specialties, Inc, is expected to lead to further miniaturization of electronic parts. *Minneapolis-Honeywell Regulator Co, Minneapolis, Minn.*



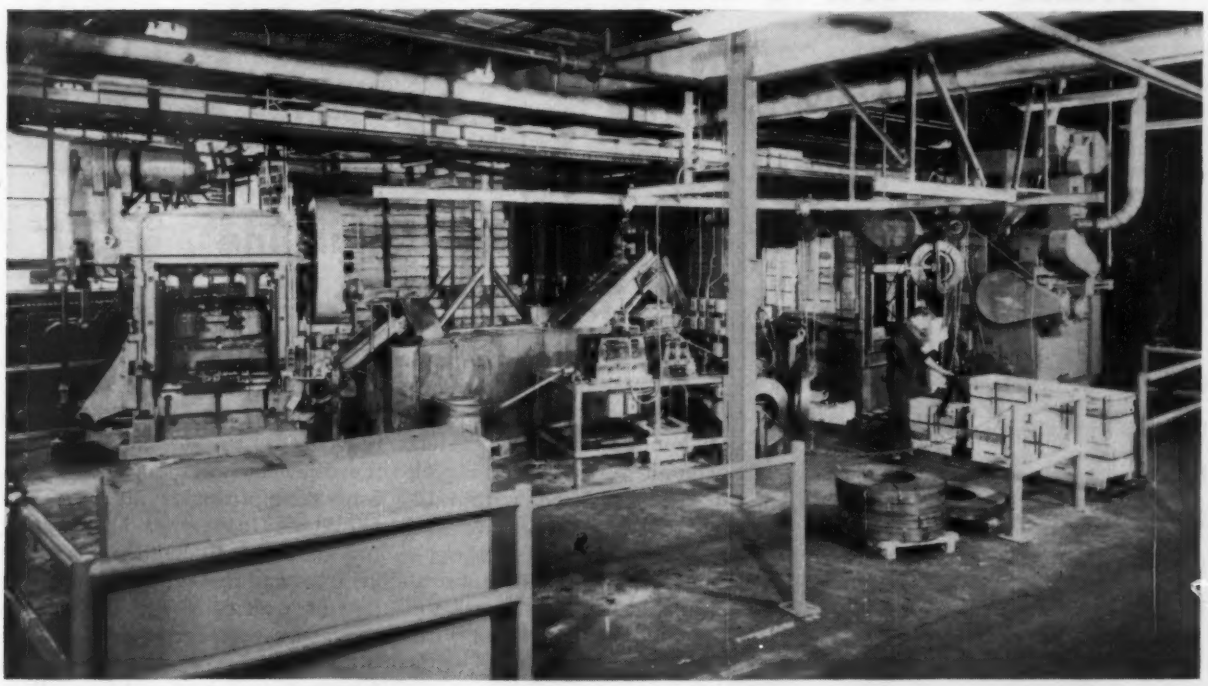
Simple welding-gun holder . . .

. . . supports Lincolnweld hidden-arc equipment while fillets are made between 12-in. flange and 8-in. pipe link. Two passes complete inside and outside fillets in 5¼ min—old time with hand methods was about an hour. Positioner rotates under gun to move work around at 14 ipm; current is 350 amp. After outside weld, small hole is drilled under flange to vent the joint, otherwise blowing would produce porosity in inside weld. *The Noland Co, Arlington, Va.*



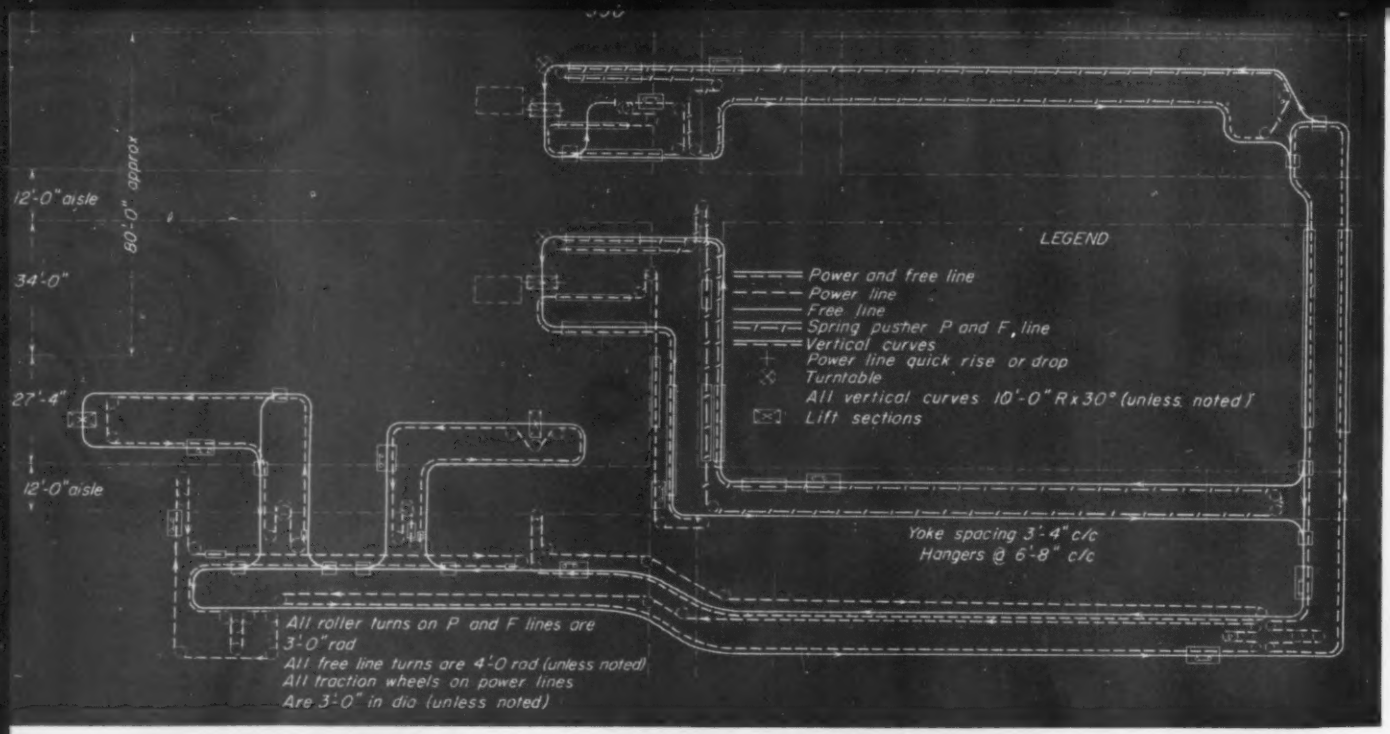
250-psi coolant . . .

. . . keeps deep-hole drill at working temperature and flushes chips out to clear tip. Work is lathe camlock spindle, set up on modified Monarch with 144-in. space, head-to-tail, and 27-in. swing. Drill cuts at 200 sfpm, feeding 1 1/16 ipm, to cut 1 9/16-in. hole 37 7/16 in. deep. Work support is a rotating guide bushing; drill support is a block that holds drill steady. Spindle forgings are previously turned on air tracer with single-point tooling and micrometer stops, guided by air-operated tracing attachment. *Monarch Machine Tool Co, Sydney, O.*



Just one operator runs a stamping line . . .

. . . with 100-ton Bliss press and stock coil, detergent wash, Wheelabrator tumble-blast, and shipping-box-loading station, where operator works. Press runs automatically until 500 pc have been stamped, then stops for 30 sec. Load of parts—wall cleats—is conveyed to degreaser, dumped to second conveyor in the tank, and carried while it dries out to the Wheelabrator-loading bucket. Operator controls basting machine electrically, and places box top on the container after it has discharged a load. Then he straps the box, producing one every six min. Setup is at Signode Steel Stamping Co, Chicago. *American Wheelabrator & Equipment Co, Mishawaka, Ind.*


12'-0" aisle
60'-0" approx
34'-0"
27'-4"
12'-0" aisle
LEGEND
Power and free line
Power line
Free line
Spring pusher P and F line
Vertical curves
Power line quick rise or drop
Turntable
All vertical curves 10'-0" R x 30° (unless noted)
Lift sections
Yoke spacing 3'-4" c/c
Hangers @ 6'-8" c/c
All roller turns on P and F lines are 3'-0" rad
All free line turns are 4'-0 rad (unless noted)
All traction wheels on power lines Are 3'-0" in dia (unless noted)

NEARLY A MILE OF CONVEYORS automatically carry front and rear Oldsmobile bumpers through copper, nickel and chrome plating tanks as well as washing, stress relieving and inspection. System has numerous lifts to elevate work to stations on various levels—required to make good use of available space

9 MEN PLATE 5000 BUMPERS A DAY

...with a mile of conveyors

...3000 limit switches

...a multimillion-dollar line

GEORGE H DE GROAT, associate editor

Gigantic plating setup at Oldsmobile Div, GMC, is finishing front and rear bumpers for a schedule of more than 2,400 cars per day. Press operations, welding, and buffing are closely tied in with it to smooth out production flow. Here's how the system works . . .

What may well be the largest bumper-plating installation in the automotive industry was completed at Oldsmobile's Saginaw Street plant in Lansing, Mich, within 10 months from the date it was started. Plant engineers and process engineers worked with Hanson, Van Winkle & Munning to set up processes and equipment and with Jervis B Webb Co, Detroit, to work out conveyor systems.

Front and rear passenger-car bumpers are finished at over 5000 pieces per day—starting with pressroom operations where 0.098-in. sheet steel, polished to about 8 mu in., is drawn, trimmed, pierced, and formed. Two press lines are set up—one for front and the other for rear bumpers—both containing transfer devices and automatic loaders and unloaders for mechanical handling at the presses and between them. The first of a series of power and free conveyors that carry the bumpers through plating is loaded after final forming operations and inspection. Before plating, however, burrs are removed when necessary, by means of portable polishing wheels, all bumpers are washed, and brackets are welded on front

bumpers. This welding operation is accomplished automatically in a special welder where four brackets are attached to each bumper — welding both sides at once.

THREE PLATING SYSTEMS

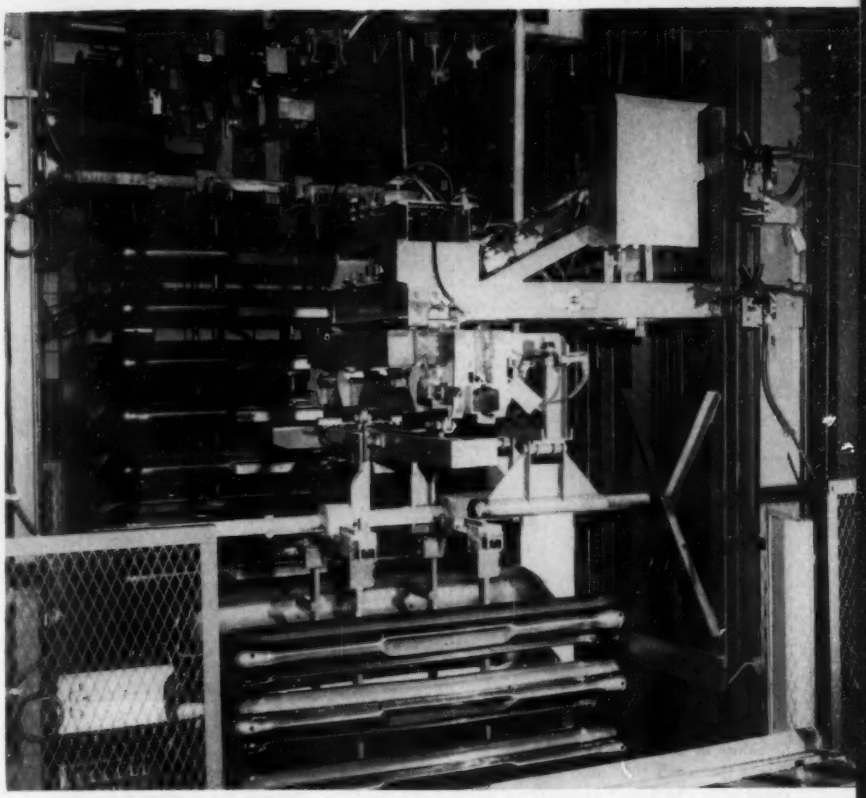
Plating is divided into three systems—copper, nickel and chrome. Bumpers go through 37 plating tanks for successive coats of copper, nickel and chrome to achieve a final plate thickness of 0.002-in. minimum. There are 174 plating racks in the copper-nickel system —each with adjustable splines that support 10 to 12 bumpers arranged in two vertical rows of 5 or 6 each. No more than 25 racks are employed in the chrome system, and each of these racks carries ten bumpers arranged in two rows of five each. Difference in the number of bumpers going through each system balances the final output because chrome plating takes less time.

The process starts after welding and a wash, at the copper-plating tanks where there are an average of 288 bumpers in the copper-plating machine when loaded. It is approximately a two-hour cycle from first cleaning to final rinse. The copper machine is timed to produce 22 racks of bumpers per hour. Oldsmobile uses a one-hour periodic reverse-current cycle in a copper-cyanide solution.

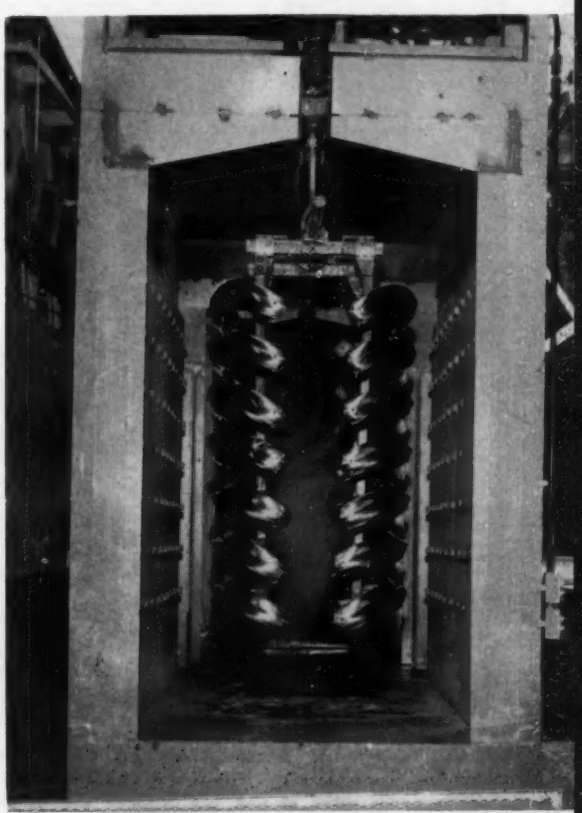
BUFFING, WASHING AND INSPECTION

Bumpers are manually transferred directly from the plating rack onto an automatic copper-buffing machine. After buffing, the work is reloaded on the plating rack and the power-and-free conveyor carries it to a special washing machine. This machine is located on the uppermost of three levels and the work is elevated to this, and others, by means of the power-and-free system. Transfer mechanisms and automatic loading and unloading devices take the racks from the conveyor, through the washer and back to the conveyor again. Location of the washer at this level conserves valuable floor space—especially necessary because the entire system was installed in an existing building.

Bumpers from this point are car-

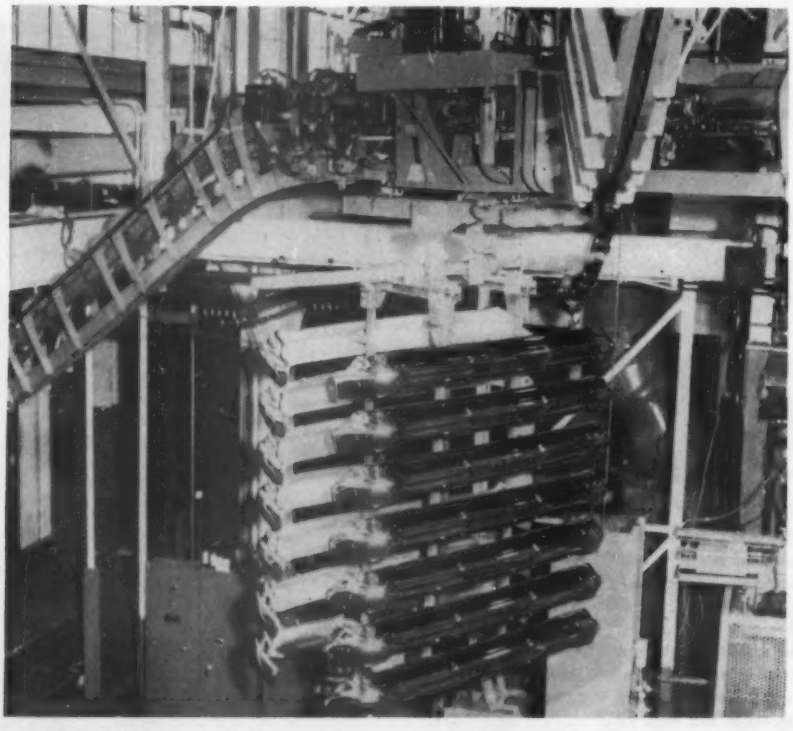


ONE OF 29 LIFT SYSTEMS, this one elevates bumpers to an inspection station after copper plating. Lifts are provided with two-speed operation, carrier stabilizers, automatic transfer mechanisms, and limit-switch protection devices—each requires two control panels and from 30,000 to 40,000 ft of control wire



SPECIAL WASHER on third deck of the three-level system is employed after copper buffing. Here, bumpers pass through the drying section, after being automatically unloaded from the power-and-free conveyor for transfer through this unit. Automatic transfer back to the conveyor follows, after which bumpers are carried to copper inspection and nickel plating

INSPECTION AFTER NICKEL-PLATING is similar to that after copper plating and metal finishing in that stations have automatic lifts raise and lower racks. Automatic controls rotate the racks 180° and back again for inspection of both sides of work. Flaws are indicated with chalk and bumpers so marked are re-routed through the process for repair



"GRAND CENTRAL STATION" is point in the system where several conveyor lines converge for automatic transfer from one operation to another. Carriers are controlled around corners and up and down vertical curves while feeders are operated with foolproof mechanisms—all related to fast time cycles

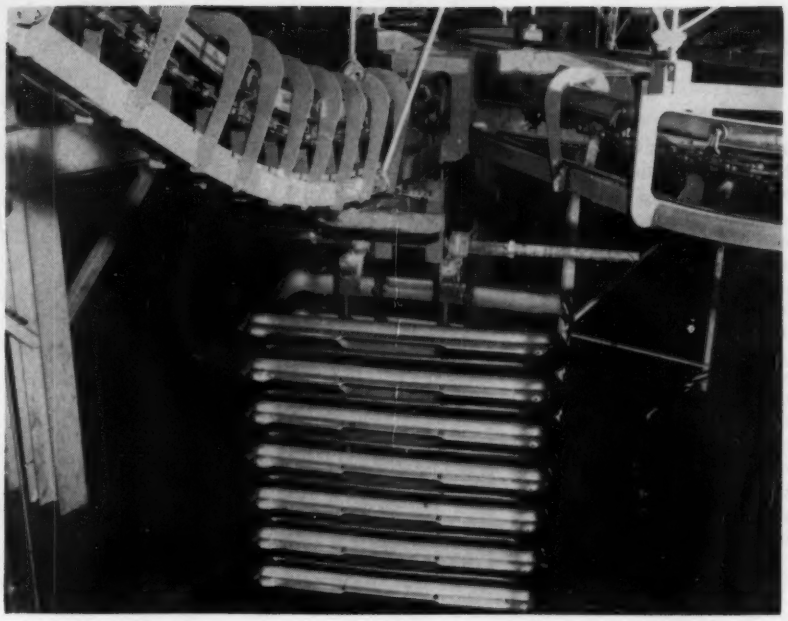
ried by power-and-free conveyor to an inspection station consisting of three elevator sections which allow each bar to be inspected and removed, if necessary, while at convenient work height. Here a battery of lights aids visual checking for flaws, and three racks of work are maintained at one time. The right station is for front bumpers and the left station for rear bumpers. The center station carries either front or rear bumpers; thus the inspector is able to remove either a defective front or rear bumper and replace it with a good front or rear bumper, whichever the case may be, allowing only good bumpers to continue through the process. When a full rack of front or rear bumpers with flaws has accumulated, it is sent by power and free conveyor to the repair touchup area. After repairs have been made, it is again sent by power and free conveyor to either copper or nickel plating. Automatic controls rotate the racks 180° and back again for inspecting both sides of the work as well as elevate them for transfer back to the power-and-free conveyor for delivery to the next operation.

Nickel plating follows, and the nickel machine is timed the same as the copper machine at 22 racks per hour. It is approximately a one-hour cycle from the first cleaning operation to the final rinse. An inspection similar to that previously described is next, after which the bumpers are transferred to the chrome system. The chrome-plating machine is timed at 30 racks per hour and is approximately a 20-min cycle from first cleaning to final rinse.

FINAL WASHING

After chrome plating, bumpers are transferred to a conventional monorail conveyor which carries them through a final washing operation. The bumpers are then stress-relieved in a special oven at 550 F for ½ hr. This eliminates hydrogen and makes the nickel-plated deposits more ductile. After stress relief, parts are carried on this same conveyor through final inspection. Bumpers are removed from the conveyor and wrapped for shipping to the Oldsmobile

main plant final-assembly lines or to one of the seven Buick-Oldsmobile-Pontiac assembly plants. Parts are banked between operations on the power-and-free conveyor system.



AUTOMATIC TRANSFER from one operation to another is accomplished by such devices as this horizontal unit in the "Grand Central" area. Over 3000 limit switches in addition to a multitude of hydraulic cylinders minimize manual handling. Versatility of the system permits banking without stopping the conveyors—allows routing of defective racks to repair and permits work to bypass portions of the process when desirable

CONVEYOR SYSTEM

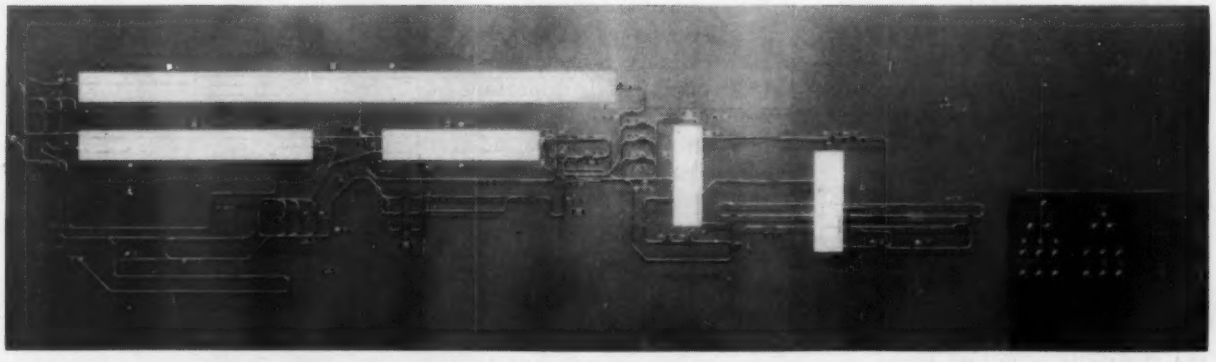
The Webb conveyor system is designed to carry 1000-lb plating racks loaded with front or rear bumpers. Consisting of over 5000 ft of power-and-free conveyors, there are 29 lift sections of four principal types. These are the two- and three-position types, the offset and the rotating types. Lifts include two-speed operation, carrier stabilizers, automatic transfer mechanism for putting racks on and off and numerous other features. Because of the height of the racks, it is necessary to have lift sections to move them up and down for easy loading and unloading. In addition, lifts are provided at all inspection points to permit inspection on the racks.

The system is made up principally of 11 spring-pusher type power-and-free conveyors but also has six solid pusher conveyors. Spring pusher conveyors are designed to store 5-ft-long carriers in banks without stopping the conveyor. These conveyors presented several problems, one of which was the need to accelerate rapidly the heavy carrier load from zero to 60 fpm. It was necessary to operate conveyors at this speed to supply parts for the processes with short cycle times. As a result, spring force against the pusher bar had to be 250 to 300 lb. Both the driven dogs on free trolleys and the drawing bar on the spring pusher assemblies are made of heat-treated alloy steel.

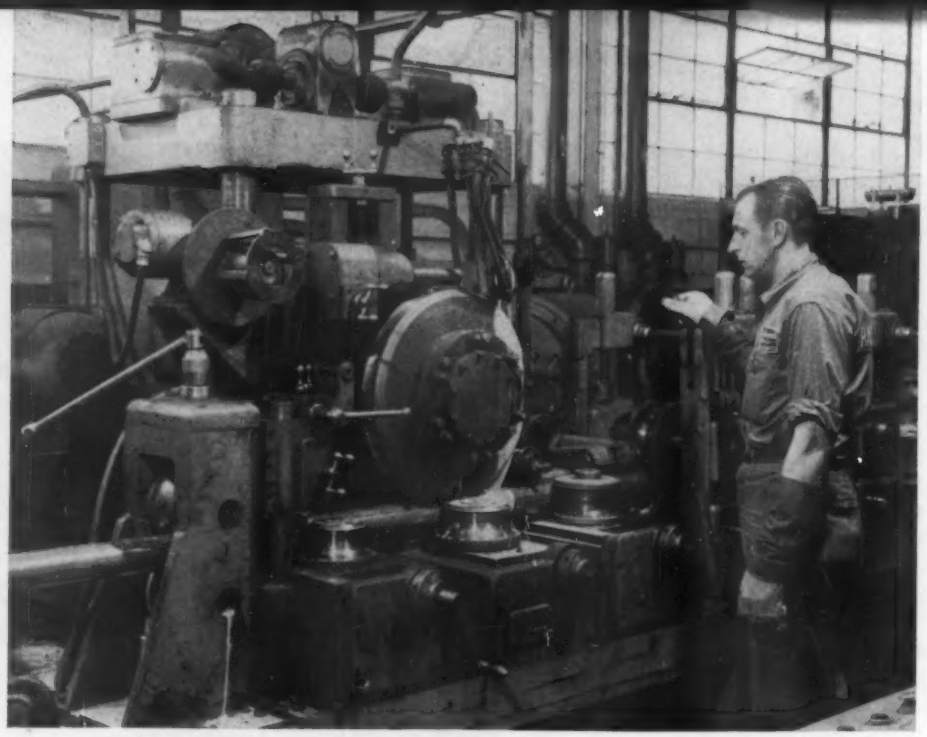
A driven-dog depressing mechanism is included to eliminate excessive vibration in the system caused by the heavy spring pushers when the carriers are banked, This eliminates 90% of driven-dog wear and vibration in the system by depressing the dogs of all the carriers in the bank except one at the feeder mechanism.

In addition, it is also necessary to control the carriers around corners and up or down vertical turns, stop-feeders are used for this control. They are carefully placed and operated with foolproof mechanisms.

The control system includes two telephone operators stationed at the start and middle of the plating line. A central control room is alerted to stop the system when any of these operators see a rack improperly loaded. Only three men handle the copper line, two each the nickel and chrome lines, plus the two telephone men.



CENTRAL CONTROL PANEL for power-and-free conveyor checks the entire system. Three others are employed to control the copper, nickel and chrome lines. Warnings from two telephone control men stationed in the lines alert the control room to stop the system. In addition, panel lights indicate trouble at various points



WELDED TUBING is produced from 0.065-in.-thick strip steel 9½ in. wide in a continuous process. As tube comes from the forming section, where the strip was progressively rolled up into a round, it enters a seam-guide unit which supports it with idler rolls and guides it with roller disks above. At the welding electrodes it is again supported by idler rolls and, after being butt-welded, it moves to a scarfing unit where the bead is removed as a long continuous chip which is rolled up on a scrap winder

Ultrasonic inspection speeds drive-tubing output

High-speed, continuous production of tubing at Saginaw Steering Gear is facilitated by an ultrasonic inspection setup built in line with a new resistance-weld tube mill. The new method of inspection replaces a hydrostatic setup—does a better job, faster. Here's how it works

LEO ADAMS, Plant No. 1 Metallurgist
SAGINAW STEERING GEAR DIV, GMC

Coiled strip steel, (SAE 1020) 9½ in. wide by 0.065 in. thick, is used to make 3-in.-dia tubing for automotive drive shafts at Saginaw Steering Gear's Plant No. 1. New equipment installed for this purpose is an Etna continuous tube mill with a 180-cycle stitch welder. Running at 80 fpm, the unit rolls the stock, butt-welds it and passes the resulting tubing into a cutoff machine.

Before reaching cutoff, however, the tubing is continuously inspected for weld quality by means of a Sperry Reflectoscope — an electronic device that generates ultrasonic vibrations to travel through the tubing in a pulsed beam, reflecting discontinuities in the weld back to an oscilloscope. At the same time, when occlusions or other weld defects are indicated, a signal circuit is excited to paint the section of the weld where the defect was discovered.

Considerable ingenuity was required to apply this technique to tube rolling and welding because of the speed of the operation, which ordinarily makes it difficult to mark weld defects accurately. Accuracy, of course, is important because the operation is continuous, and when a bad weld is indicated it is necessary to adjust the welder immediately. To avoid waste, only the defective action of the tubing should be marked.

A special attachment that permits measuring the size of weld defects in the tubing on the oscilloscope screen makes this method of inspection possible because it also actuates the signals that excite the marking device for simultaneous location of defects.

SIZE SIGNAL SHOWS QUALITY

Heart of the inspection system is a quartz-crystal transducer in a curved plastic searching unit which receives electrical impulses from an oscillator at a frequency of 1 megacycle. These impulses are converted to mechanical vibrations in the crystal and are transmitted as surface waves through the tubing wall. A flow of soluble oil on the tube-mill rolls just ahead of the transducer acts as a couplant to maintain surface contact between the tube and the transducer, thereby facilitating transmission of ultrasonic vibrations. In addition, automatic positioning of the transducer to conform with the position of the tubing in the mill at this

point further improves this contact to insure a strong signal on the oscilloscope.

Ultrasonic vibrational waves travel in a straight line around the periphery of the tubing, through the wall to the weld, which is 120° away from the source, and are reflected back to the crystal only when defects occur. If there are no defects, the signal is transmitted completely around the tubing—back to the crystal—and show up on the oscilloscope screen as equally spaced indications 360° apart. In effect, the crystal acts as a transmitter during one part of a split second and as a receiver during another because the reflected energy is re-converted into electrical impulses and transmitted to the cathode-ray tube in the oscilloscope. Here the time of total travel through the material is measured by means of range markers on the screen which provide precise measurement of distance, the time interval being proportional to the distance from the entrance surface. A void, occlusion, or crystalized weld produces an acoustic impedance mis-match so only a portion of the signal is transmitted around the tubing, picked up by the crystal and recorded as an indication on the oscilloscope. The balance of the initial signal is reflected from the defect back to the crystal which in turn causes a discontinuity signal on the oscilloscope. Usually, defects show up on the screen as small images, or indications, about 1/3 the size of those produced by full signals.

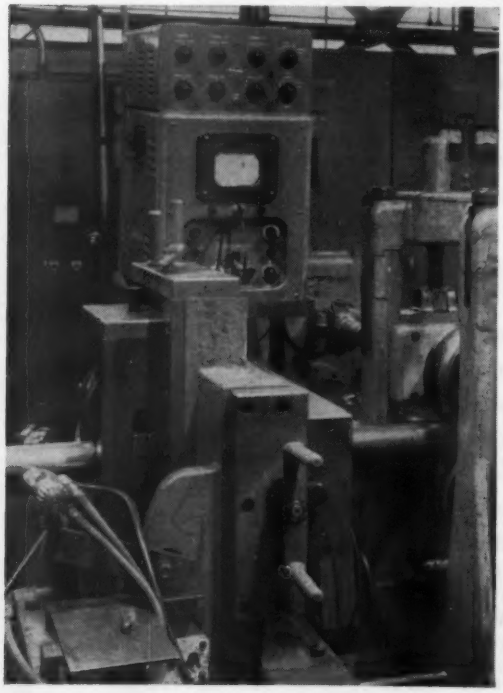
Signals reflected back to the cathode-ray tube in the oscilloscope are carried to an RA attachment which controls the Brush recorder and contactor that are the signal mechanisms for actuating the marking device instantaneously. To do this, the attachment superimposes gates on the oscilloscope screen by means of which the amplitude of all signals can be measured and then recorded on the Brush device in terms of voltage variations. The gates are established on the basis of a predetermined size of defect known to fail as the result of physical tests.

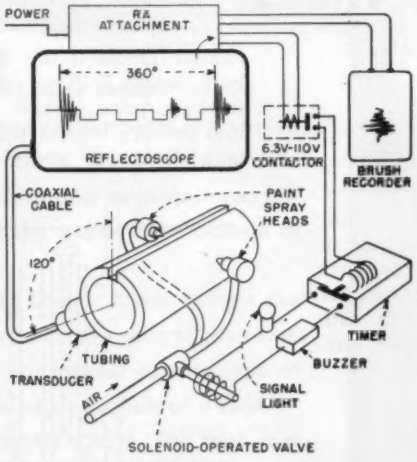
By employing the amplitude of the reflected signals to vary the voltage at the recorder, minute defects, (although they are reflected on the oscilloscope and recorded) do not excite the marking device because the recorder is set up within a range of 14 volts variation, based on the amplitude of defects whose size can cause failure. These excite a timer which is actuated only through the RA attachment. The timer causes the marking device to paint one foot of tubing, regardless of the length of the defect, and eliminates throwing paint around as the result of flutter that would occur because of the sensitive and rapid action of the recorder indicating device.

BETTER WELDS

It has been found that the Reflectoscope detects flaws that were missed by the former hydrostatic method. Fatigue tests to destruction that were run on tubing rejected by the ultrasonic inspection method showed premature failure, whereas some of these had been passed by the hydrostatic method. For example, welds made at an indicated 240 volts broke in fatigue and drift tests where the tube must expand 5% of its dia under pressure from a tapered pin. These had been rejected by ultrasonic inspection but passed hydrostatic tests.

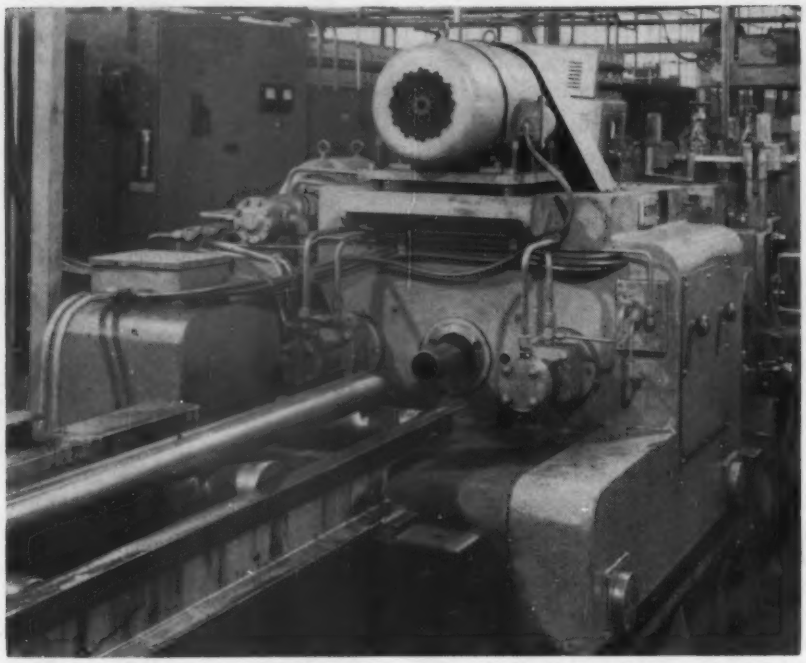
An indication of the quality of the welds produced in this setup may be had by the fact that indicated welding voltages of 280 to 340 produce tubing that does not break at the weld under destruc-





QUARTZ-CRYSTAL TRANSDUCER is the heart of the ultrasonic inspection setup. Electrical current at 1 megacycle is transmitted from the oscillator to the transducer, which converts it to ultrasonic vibrational waves that travel through the tubing wall around the periphery to the weld. Reflections of these pulses return to the crystal which converts them back to electrical energy for transmission to the cathode-ray tube in the oscilloscope

ULTRASONIC INSPECTION and marking of welded tubing at 80 fpm is made possible by an RA attachment and this electronic instrument. The attachment controls signalling mechanisms that actuate a marking device instantly when a defective weld is discovered. Result is the bad area is marked accurately even though the tubing runs through inspection continuously at high speed. When a new section of tubing starts through—after one coil is finished and a new one started—the searching unit of the Reflectoscope must be placed in contact with the work again. This operation occurs about every 20 min, and is done automatically by electrical and air operated mechanisms



CUTTING TO LENGTH WITHOUT STOPPING the tubing is accomplished after inspection by rotary cutoffs synchronized with the speed of the tube. Changes in the speed of the mill are automatically followed by a travelling carriage which contains the rotary cutoff tools and tube-clamping mechanism. In operation, the end of the moving tube actuates a tube "target" that electrically sets the cutoff carriage in motion. During the first 6 in. of carriage travel, the jaws clamp the tube and the tools feed in for the cutting operation. After the tube is cut off, the tools retract, the jaws unclamp, and the carriage reverses and returns at high-speed to the starting position

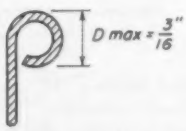
tion tests. Between 250 and 280 volts inclusive, welds broke at the stitching but passed 5% drift, torsion, and shock tests as well as both Reflectoscope and hydrostatic inspection. At 240 volts and below, all tubing was rejected by the Reflectoscope and failed shock tests. These voltages, of course, are not those actually used in welding, where low voltages are employed with high current, but are merely voltage-regulator indications which vary with different heats. They show, however, that lowering voltages below a critical point results in poorer welds.

In the actual operating range, welds are produced that can withstand torque loads in excess of 40,000 in-lb and shock loads of 1200 ft-lb for 100,000 cycles as well as the 5% dia expansion test. Besides high quality, production is high, and is achieved by two men on the mill—one at the welder and one at the Reflectoscope. The Reflectoscope operator also loads coils into the mill, adjusts the tube-straightening device, and periodically runs destruction tests on the tubing.

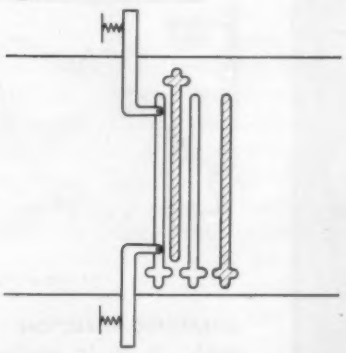
Diemaker's Kinks

FEDERICO STRASSER

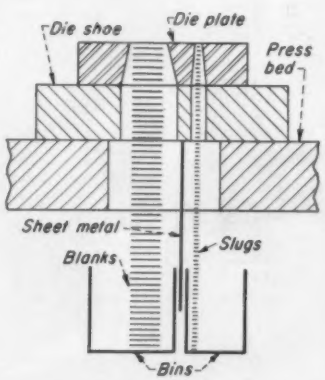
KNURLING will increase the diameter of a dowel pin so that it can be used to assemble die members which have holes too large, for some reason, for a press fit with a pin of the correct nominal size.



IN CURLING, the maximum diameter of bead that can be formed bears a relationship to the work diameter and thickness and temper of the stock. In tinplate and similar products the diameter is held below 3/16 in. Extra-large beads require several operations and perhaps intermediate annealings.



TWO TRIGGER STOPS are better than one, when feeding fragile, wide stock. If only one stop is used, the stress caused by the feed pressure may tear the strip skeleton.



SLUG SEPARATION can be achieved in progressive dies by putting a sheet-metal piece in the die-bed opening and just under the die wall between the piercing and blanking stations. Thus, blanks can be directed into one bin and slugs into another, to keep them separated.

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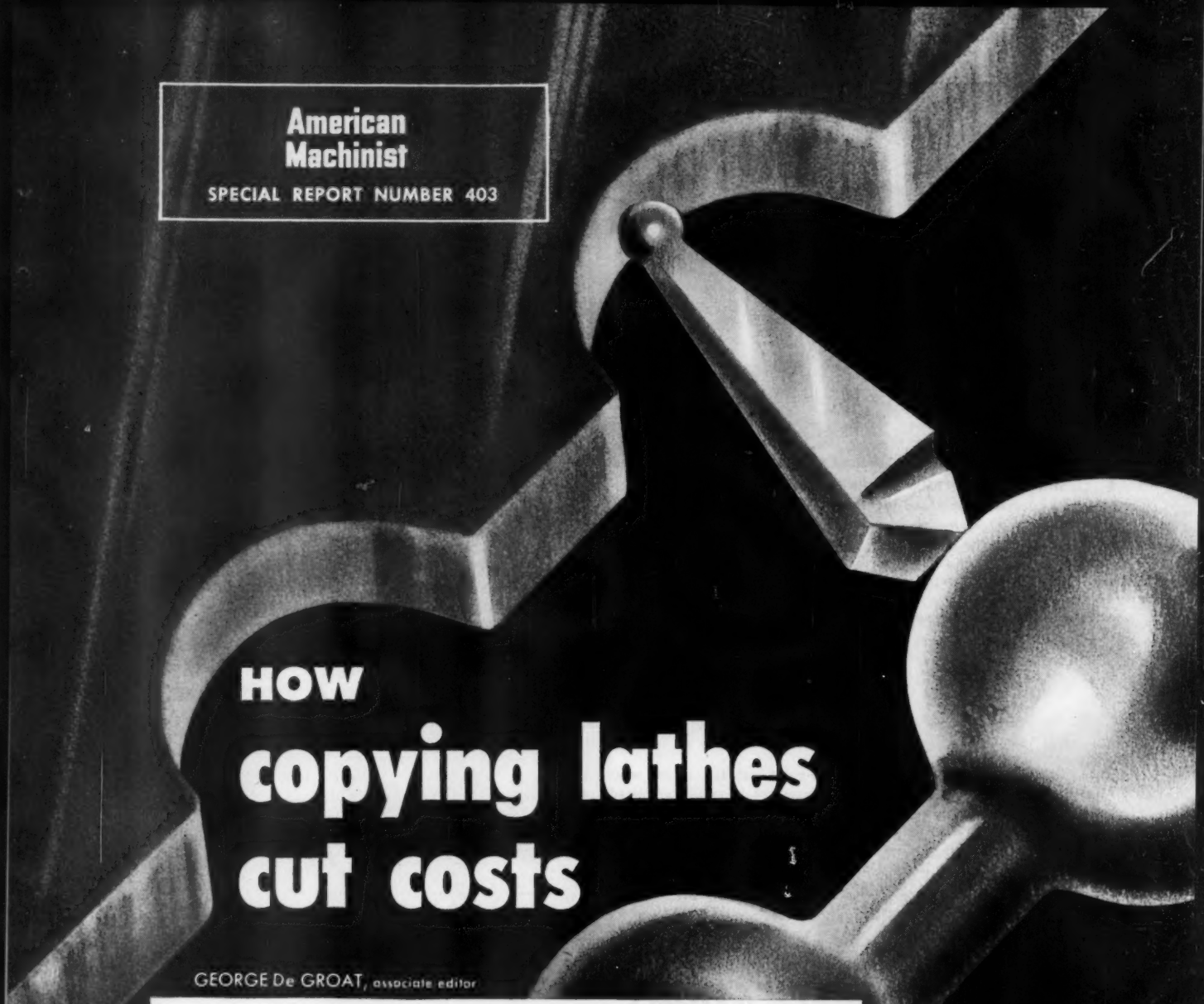
SPECIAL REPORT NUMBER 403



HOW copying lathes cut costs

GEORGE De GROAT, associate editor

Interest in turning and boring parts of irregular contour as well as simple shafts has been stimulated by new developments in copying lathes and tracer and duplicating attachments. Application of this equipment has become more and more widespread as contour turning and boring have progressed rapidly from the experimental stage to accepted methods.

There are three types of contour turning: One is lineal, where the contour to be reproduced is roughly parallel with the axis of the lathe center-line, as on stepped shafts—one of the largest applications of copying lathes. Another is radial, where the reproduction of a contour is on the circumference of the work, such as on a cam. The third is a combination of these two, often used in die or mold-making. Numerous advantages are gained by contour-turning in such applications: simple single-point tools can be employed with a templet in place of more complex multiple-tool setups, repetition is possible without effort, and reproduction with a high degree of accuracy is achieved.

Numerous case histories in this report show the types of work being handled and results obtained.

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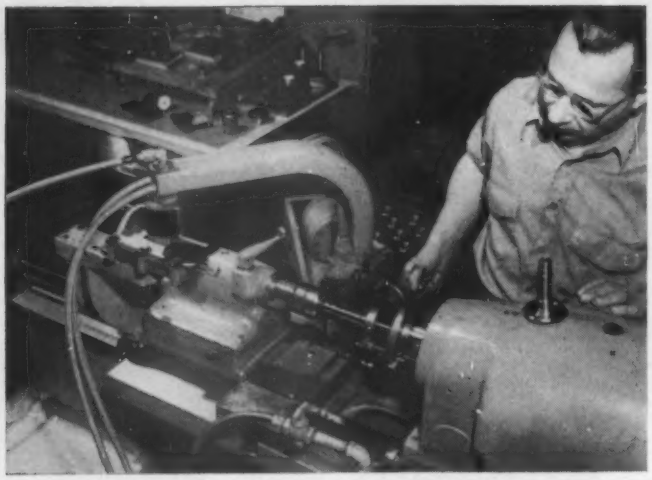
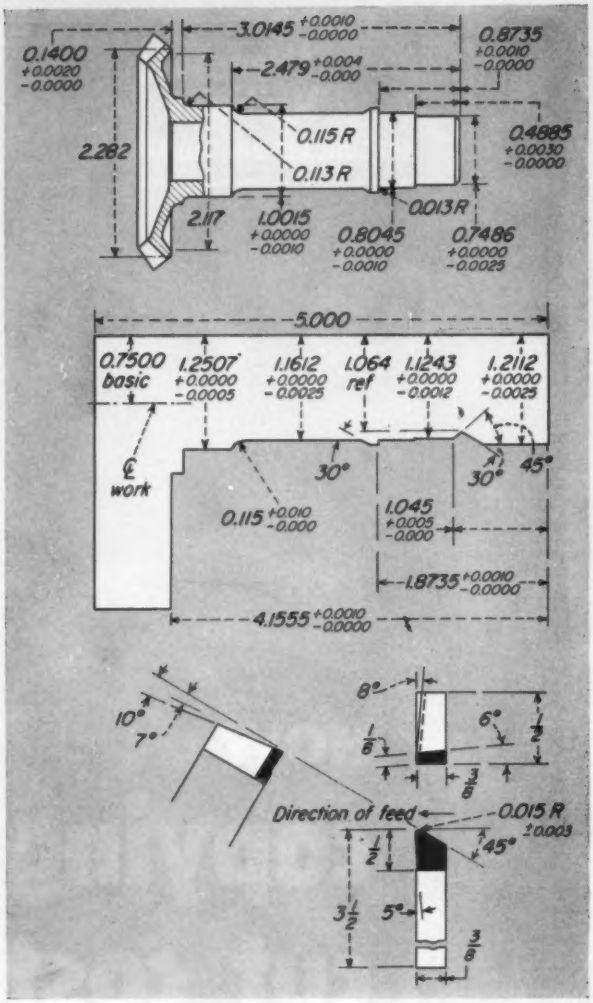


1 . . . SHORT-RUN CONTOUR TURNING of AMS 6263 bevel-gear blanks on centers is handled quickly and accurately with this Air-Gage tracer attached to a Monarch 10-in. Model EE. Although closer tolerances can be held, axial dimensions are maintained within 0.001 in., diametral dimensions within 0.0025 in. Parts run around 3 in. long with the largest of numerous dias to be turned about 1 in. Stylus, pneumatically controlled, contacts with 5-oz pressure, controls toolslide-operating hydraulic piston by moving a metal diphragm in the valve



2 . . . ONLY ONE TEMPLET and one single-point carbide tool are required. Although round templets or master workpieces are generally preferred for short runs, flat templets are easily stored—and for this job are especially useful because it is repeated frequently. Stock removed from the blank is 0.015 in. at 0.003-ipr feed and 700 rpm. Tracer toolslide replaces conventional compound rest, is fixed at 45° so both axial and radial turning can be done

SHORT-RUN APPLICATIONS

Copying lathes and tracer attachments offer certain advantages for turning irregular contours in low-volume setups. Change-over time from one part to another, for example, is a lot faster when only a single tool and a templet are involved than where multiple-tool setups or form tools must be changed. Higher surface speeds that reduce machining time are possible because one or two tools cause far less vibration than multiple-tool setups. In addition, no time is lost in repositioning tools because the templet makes the single tool cut continuously.

Of course, much depends upon individual conditions, but generally even 10-, 20-, or 30-piece lots can be handled advantageously with copying lathes even when machining time is no shorter than in conventional setups.

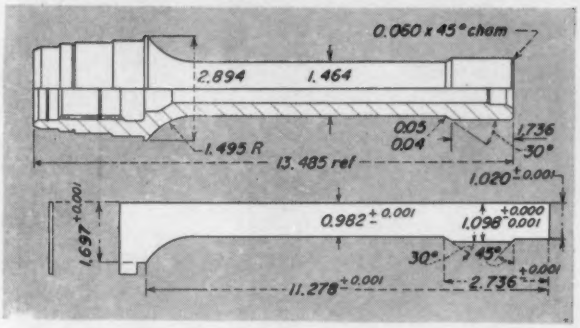
One reason is because secondary operations, often necessary with conventional methods to meet finish requirements or hold close tolerances, are in most cases reduced and sometimes eliminated. Accumulation of vibration inherent in multiple-tool setups adversely affects jobs where high surface finishes are needed unless low speeds and light feeds are employed. A single-point tool, with its considerably lower total vibration, often permits speeds and feeds about double those possible in conventional practice. Pressure on the work is less too, so distortion on long, slender shafts or thin-wall rings is minimized and greater accuracy obtained. As a result, grinding allowance can be halved, or grinding or polishing can be eliminated.

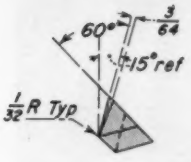
The necessity for measurements during the operation is eliminated and the chance for human error reduced, thereby speeding the job and materially cutting scrap losses—contributing to lower cost per finished piece. In addition to light finishing cuts, copying lathes are widely used for relatively heavy work—many being employed to take cuts ¼, ⅜ and even ½ in. deep.

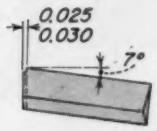
SHAFTS AND GEAR BLANKS

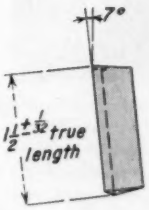
One aircraft-engine plant uses a number of copy-

3 . . . FINISH-TURNING all outside dias on this shaft is done with a tracer-attachment slide at 45° to the lathe center. All angles can be traced within 90° range between parallel with the lathe centerline and perpendicular to it. Two templets are employed—one for a long simple contour beginning with a large radius at one end of the shaft, the other for a shorter, more-complex form at the opposite end. Templet shown is first employed to turn a complete batch of shafts—then the shafts are run through again using the second templet

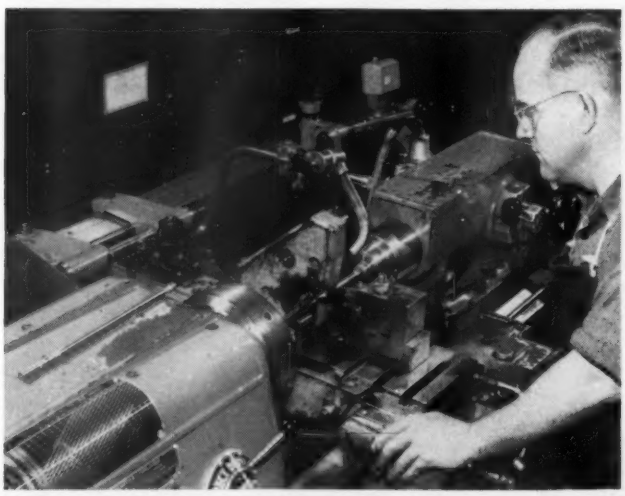




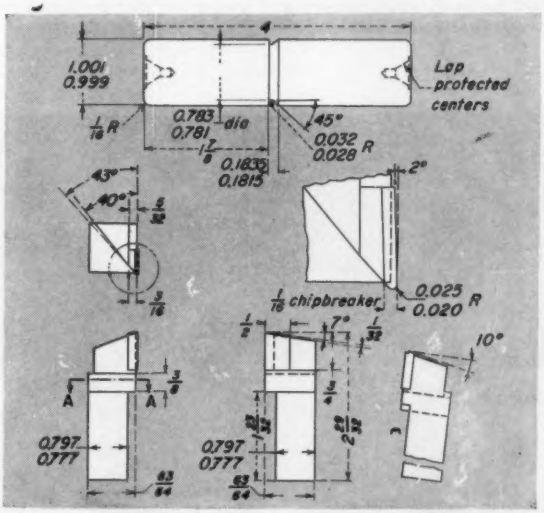




4 . . . SOLID-CARBIDE INSERT machines AMS 6263 shaft where two different templets are employed to handle opposite ends. About 0.050 in. of stock are removed at 0.0052-ipr feed and 762 rpm, holding a tolerance of 0.002 in. on dias. All contours except a thread relief are completed in much less floor-to-floor time than required in conventional setups



5 . . . LONG, SLENDER SHAFTS of AMS 6470 steel are contour turned in this HEB Model OP 420 all-hydraulic copying lathe. Vibration of overhanging multiple-tool setups would ordinarily cause distortion, reduce accuracy. Here two specially ground carbide single-point tools—one in the rear for finishing cuts—are held vertically for maximum support. Tracer bars and tools are changed for turning various contours along the relatively long shaft. Although six such setups are made, floor-to-floor time for completely forming a thread relief, thread dia, bearing dia and a shoulder is relatively short



6 . . . ROUND TRACER BARS and specially ground carbide tools are employed, and both are changed to assure efficiency for various angles of entry. Tool design is especially important to suit rapidly varying conditions. Chipbreakers require special attention because of high machining rates. Tracer bar shown is one of several used to produce contours where tolerances of plus or minus 0.0005 in. are held on dias and plus or minus 0.002 in. on axial dimensions

ing setups for machining jet-engine components. Production volume is relatively low, but costs must be kept down, and high quality and accuracy maintained. One operation is finish turning of all stem dias, shoulders, and faces on a bevel-gear blank (Figs 1, 2). Air pressure at 65 psi from the shop line is supplied to the tracer head.

When the stylus comes into contact with a templet section perpendicular to the centerline of the lathe, air is bled sufficiently to reposition the hydraulic valve so the piston travels out 1.4 times faster than the longitudinal feed. Result is a straight facing cut with the tool moving across the face of the work at the same rate as longitudinal feed of the carriage. If necessary, the lathe can be quickly changed over for other work. Switching over to

7 . . . CONTOUR FACING of a somewhat larger piece is performed at a constant cutting speed in this Model KDM 18/150 New Britain, GF lathe where an adjustable-speed motor automatically increases spindle speed as the cutting tool progresses from the largest dia toward the smallest. Result is a uniform finish with maximum efficiency. At the largest dia, spindle speed is 425 rpm, feed stays at 0.0035 ipr to remove about 0.100 in. of stock from AMS 6342 steel flange. Contour turning and boring are also performed with different tools and templets

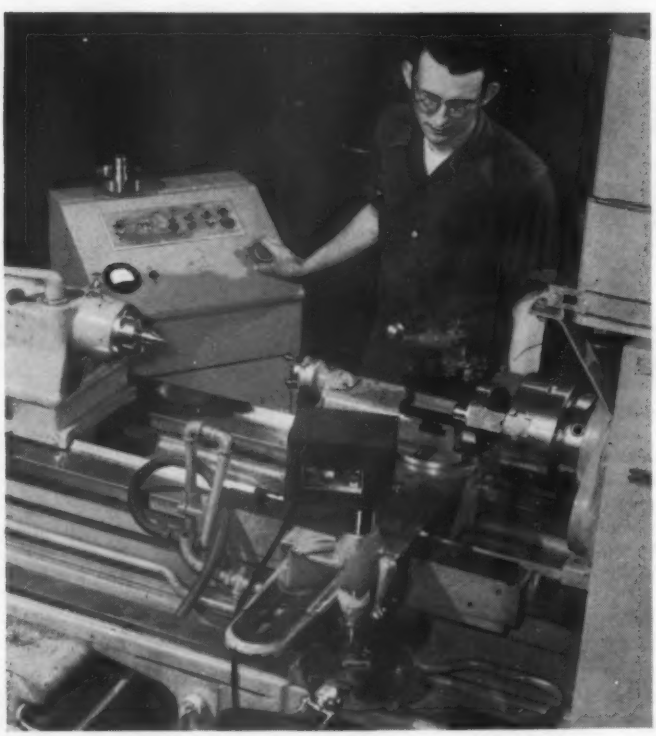
manual turning, boring or threading operations is accomplished by locking the toolslide in the stop position with a lever and removing the stylus so the tracer head will clear the templet.

In the same shop, two templets produce the required contour in a somewhat more complicated shaft (Fig 3, 4). Without the tracer setup, it would have been necessary to use a complex multiple-tool setup, make expensive form tools, or turn the various steps slowly and carefully—checking dimensions frequently. Tolerances held in the tracer setup are closer, turning time shorter, and finish better.

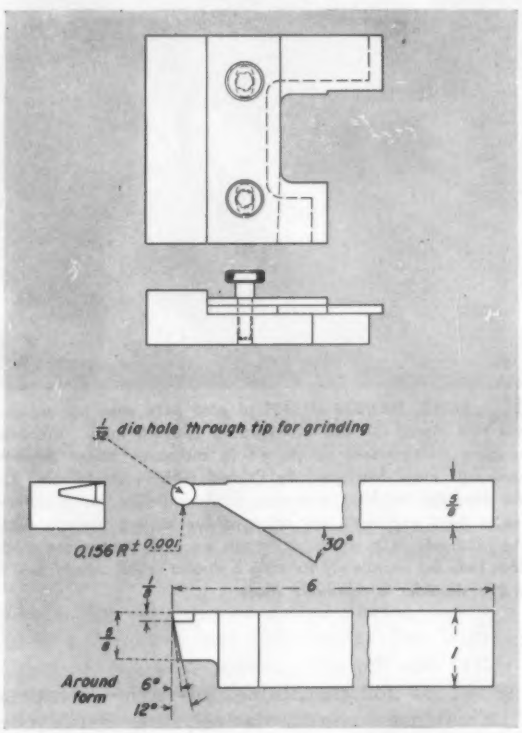
MULTIPLE-TEMPLET SETUP

Another setup employs a true copying lathe with tools on both front and back slides for contour-turning a long, slender oil-pump shaft (Figs 5, 6). Rigidity is a prime requirement in such work and is obtained to a great extent by the absence of overhanging tools and the absence of a compound slide. Held between centers, the shaft is supported by a follower rest while approximately 0.050 in. of stock are removed at a feed of 0.0056 ipr and 1400 rpm. Maximum accuracy is obtained with the tool slide at right angles to the bed.

A somewhat larger steel flange is semi-finish turned, faced and bored in three operations on an



8 . . . NO BLENDING or tool marks are permissible on this job, where pockets, or recesses, in both sides of AMS 6263 gear blanks are finish-turned. Electrically controlled tracer on a 16-in. Monarch-Keller form-turner provides quick setup time and high production rates. Stock removed is 0.015 in. with a feed of 0.0027 ipr and a speed of 1000 rpm—holding depth of recesses within 0.010 in. Resulting finish is good enough to eliminate polishing or grinding afterward, and floor-to-floor time is short



9 . . . ADJUSTABLE TEMPLETS and disk-type carbide profiling tools are used. Hardened and gronnd B & S flat stock is used for templet plates that can be opened up to increase dia of recess in blanks. Disk-shaped brazed tips on tools provide efficient cutting action regardless of direction of tool travel in machining internal contours

all-hydraulic machine with different templets and tools (Fig 7). Here again, setup time is very short because the single-point tool can be mounted quickly in a rigid holder that supports the whole length of the shank, the point being set at the proper height by means of a gage. Templets are in front of the machine and, after being mounted in an approximate position, are accurately located relative to the workpiece with micrometer setting scales.

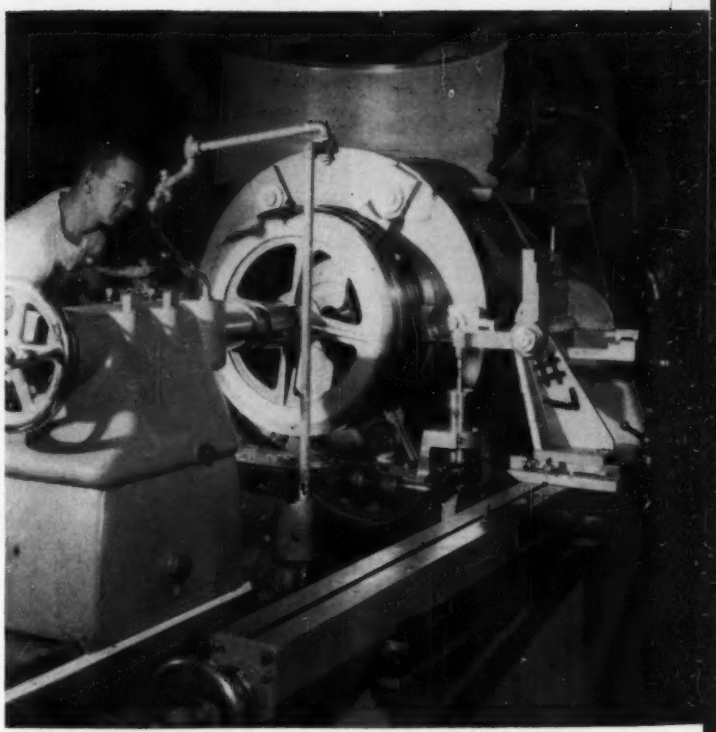
Another relatively short-run job in this plant requires an extremely smooth finish (Figs 8, 9). The machine is controlled from a cabinet at the operator's side for automatic operation. DC for the controls is produced by a small converter in the cabinet. In this setup, the toolslide operates at 90° to the center line of the work. A stylus controls longitudinal travel of the carriage and transverse movement of the cross-slide through magnetic clutches that engage and disengage the regular feedscrew of the machine. Three positions of the stylus are determined by pressure changes at the templet. One brings the tool into the work, another feeds it parallel to the axis, the third feeds it away from the work. Deflection of the stylus makes or breaks contacts that energize or de-energize the clutches instantly.

THIN-WALL RINGS—BORING AND FACING

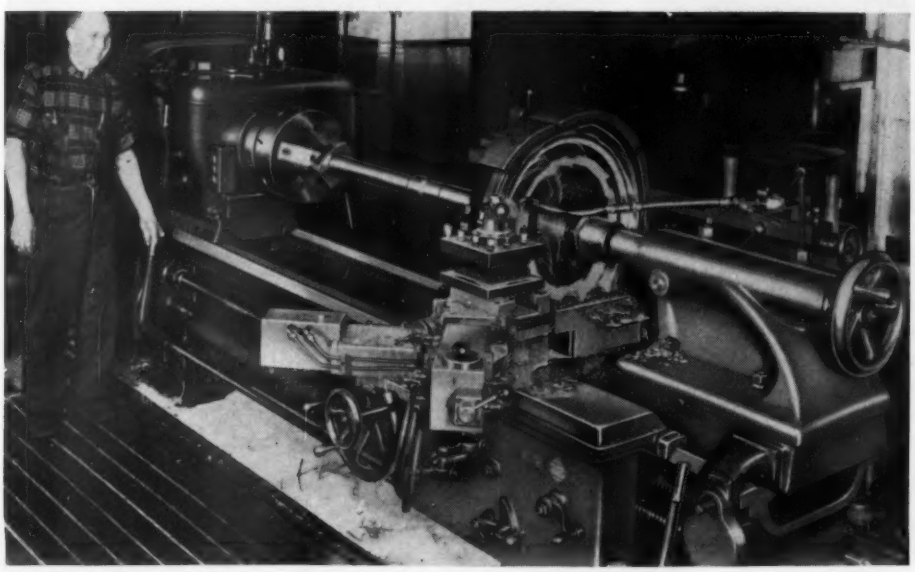
Contour turning thin-wall shroud rings at another plant (Fig 10) provides a further example of the application of copying equipment for relatively shortrun production.

After numerous intermediate operations, the copying work is done in conventional Boye & Emmes, McDougall, and Lehmann lathes equipped with 2-cyl Turchan followers. Critical wall thickness as well as close tolerances on axial dimensions are maintained in this setup, although later form grinding of contours is required.

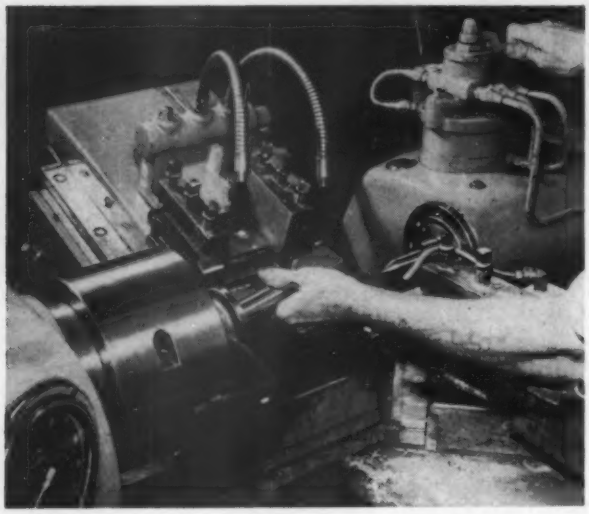
Other applications of contour boring and facing in-

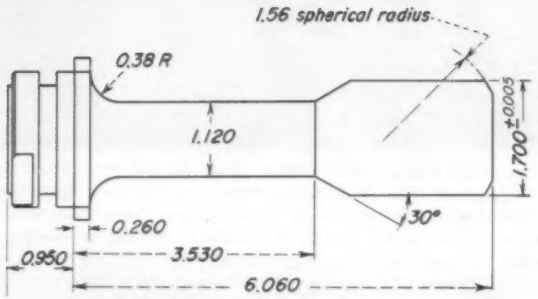


10 . . . THIN-WALL RINGS (about 20-in. dia by 8 in. long) are contour bored, faced and turned before parting them from AMS 6412 forgings, each long enough to make three rings. Four-position templet carrier at the rear of the lathe is indexed to present a templet for each operation—beginning with boring by a cross-slide tool while the work is held on the OD at one end. After the bore contour is produced—by means of the hydraulic follower attachment—the special live center shown is engaged to support the thin ring while contour facing from the turret is performed. This is followed by turning the OD, when another templet is indexed around for engagement with the follower stylus, and the turret rotated, after which the ring is cut off. The templet is then indexed *axially* for repeating the process on the second and third rings—stopping against locating pins that establish its position relative to the toolpost



11 . . . ONE OF SEVEN ENGINE LATHES equipped with Turchan followers for contour-turning large jet-engine components. This Nebel machine employs an air-operated face plate for rapid chucking and unchucking and a Reliance variable-speed drive to provide constant cutting speeds while machining varying contours





12 . . . MACHINING TIME IS REDUCED 90% in this setup where 4130 heat-treated forgings are contour-turned in a Monarch Mona-Matic. A turret-lathe operation, as well as an engine-lathe and a grinding operation, were replaced by this high-production application of a copying lathe. Setup time was cut from 3 hr to less than 20 min, and total machining time ran 5 min per piece

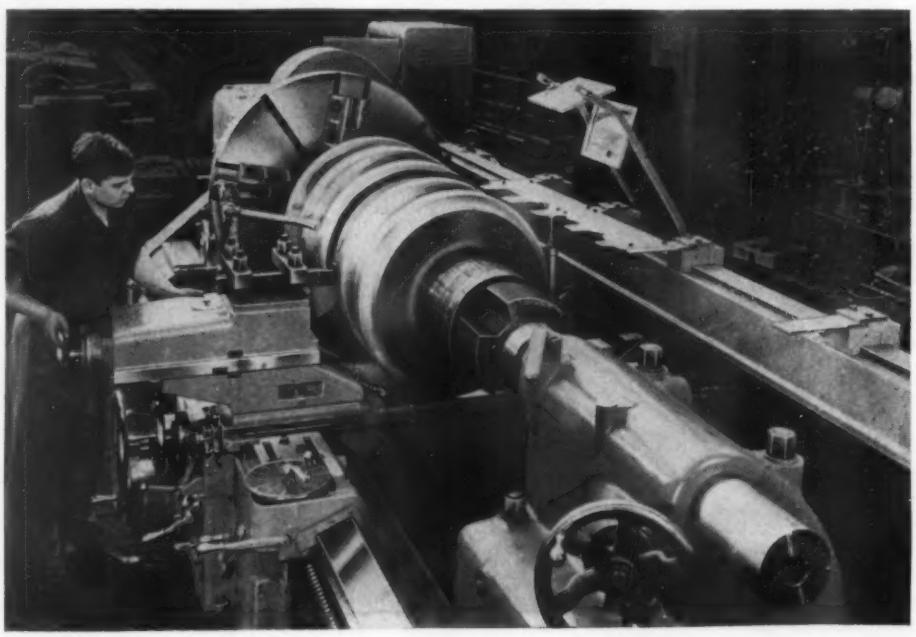
clude combination operations in another shop where aluminum cylinder heads for diesels are made. This work is done with an American duplicating lathe on which the standard lathe crossfeed is used together with a flat templet and cutter bars held in a 4-way toolblock. Facing is handled by a single-point tool in the block when the slide positions it at the front of the lathe center, while contour boring is done with an extension tool when the slide is back of center. Floor-to-floor time for this job was cut from 7½ hr on a standard engine lathe to 1½ hr in the copying setup.

Boring in this manner amounts to internal turning because the work rotates in the reverse direction with the cutting edge of the tool in the conventional vertical position. With the tool back of center and in the vertical position, the operator is able to watch the tool and the work.

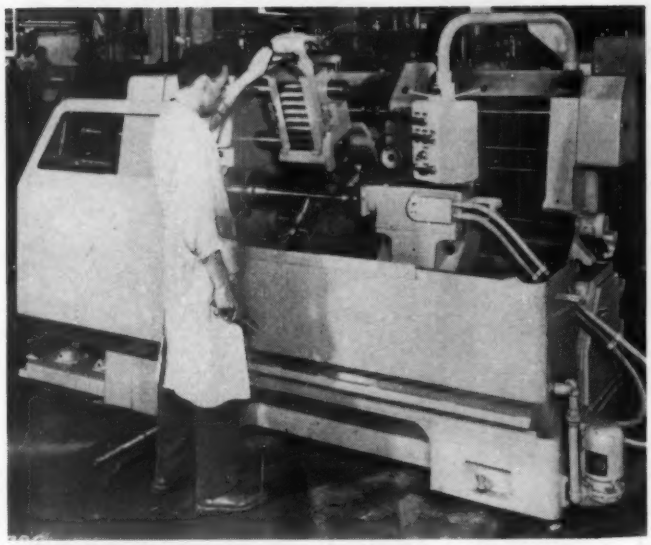
The 4-way toolblock allows use of several tools. This, of course, eliminates interchanging roughing and finishing tools and resetting to a gage each time. In this lathe, too, a hydraulic tracer valve meters oil directly to a piston, which in turn controls movement of the tool rest. Control of the tracer valve position, to establish final relationship between tracer point and tool, is maintained by an adjusting handwheel with a micrometer dial that moves an independent slide on which the tracer valve is mounted.

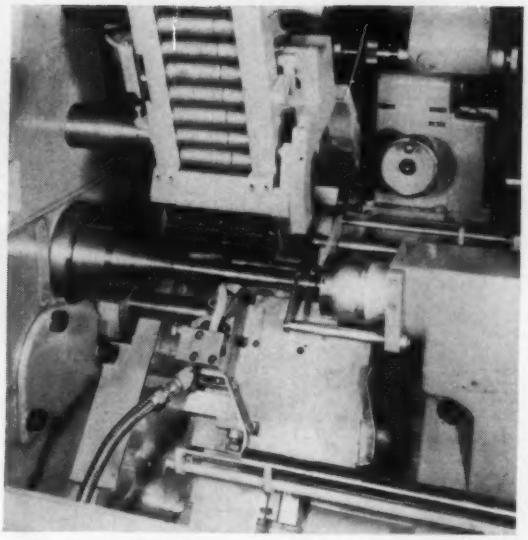
CROSS-CENTER TECHNIQUE

In other contour-boring setups where American duplicating lathes are used, a cross-center technique is employed. This differs from the other method primarily in elimination of extension tools. Here the carriage bridge is sufficiently long to permit the tool rest to travel past the center line to the rear of the lathe center. This method is usually em-

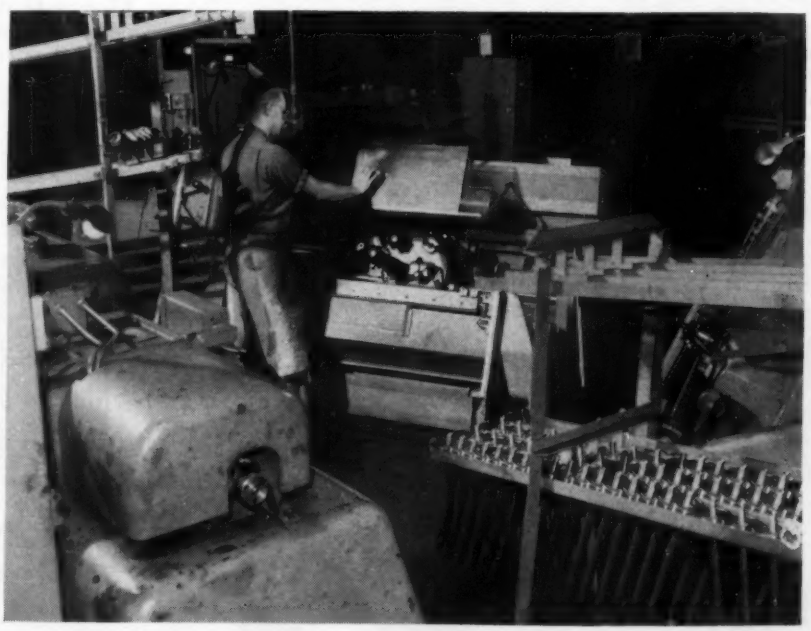


13 . . . TWO-DIRECTIONAL HYDRAULIC TRACING speeds contour turning of steel-mill shape rolls 30½ in. in dia by 51 in. long. With conventional equipment, 245 hr were required to turn multiple dias and steep angles on a set of cast-alloy semi-steel rolls; now the job takes 94 hr, with setup time around 15 min, on a 50-in. LeBlond roll-contouring lathe. One valve automatically controls two hydraulic motors for cross and length feed. The templet is at rear. Carbide-tipped tools are used at 48 rpm and 0.040 ipr





14 . . . AUTOMATED CONTOUR TURNING is approached in this setup where a hopper is loaded with transmission shafts for automatic feed to an HEB Model 310 Pilot copying lathe. At the start of the cycle the hopper releases one piece which is automatically clamped between a headstock expanding device and a spring tailstock collet. Contours are produced by a solid carbide tool in the front tool block and faced to length by a rear tool. Ejected work is pushed along rails at the machine front to a track which directs it to a conveyor for transfer to other operations. Tolerances held are 0.002 in. on dias and 0.004 in. on length. Three of these lathes, run by one operator, give high production rates and uniform accuracy



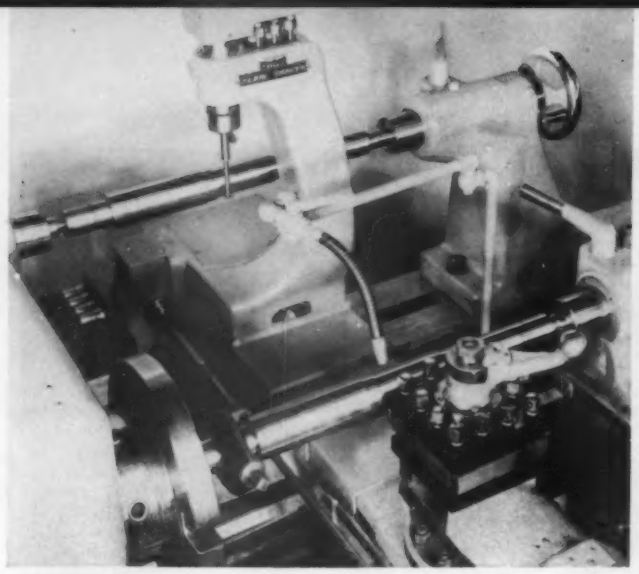
15 . . . ONE OPERATOR AND THREE NEW BRITAIN COPYING LATHES replace six automatic lathes to simplify production of multiple-dia shafts 15 in. long. New setup turns out 60 finished shafts per hour per machine. A monorail conveyor brings work in. After contour turning six dias and facing one end, shafts are sent on their way by the same means. Automatic spindle speed change, sequence control and spindle actuation permit ample time for the operator to load and unload the three machines. Single-point carbide tools with carefully designed chipbreakers permit high surface speeds, and chips fall free because the bed is at the back

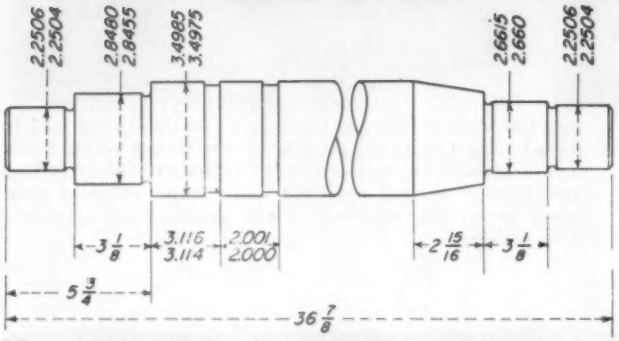
ployed when the diameter of the work to be bored is too large to permit use of an extension tool with satisfactory results because of lack of rigidity. Because of its long travel, a built-in power rapid traverse is provided on the tool slide.

AUTOMATICS REPLACED BY TRACER

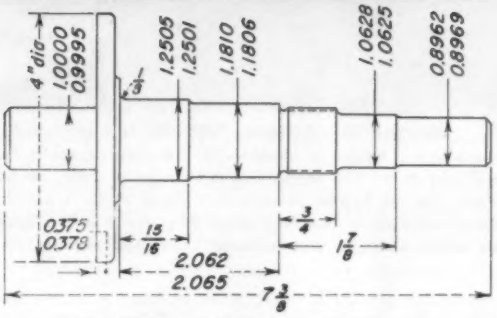
Another manufacturer replaced two automatic lathes with one engine lathe with hydraulic copying attachment for producing motor shafts. In the original setup, each automatic required seven tools and two toolblocks with setup time running about 8 hr for each machine. The new installation, a 16-in. heavy-duty LeBlond lathe and "Hydra-Trace" duplicating equipment, employs only two tools and two flat templets. Although average production rate is about the same, valuable floor space is gained, maintenance costs are lower and, of course, savings are made in tool costs and setup time.

In this installation, the first templet handles rough



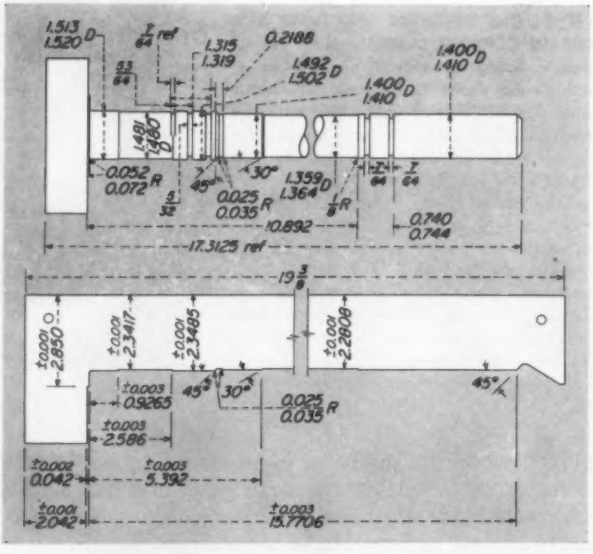


16 . . . ROUND TEMPLETS ARE EASY TO MAKE, and for work of this type a master part can be employed as a templet. Prototype parts are frequently employed as templets for short-run jobs or for especially simple contours. Here a round templet has some of the contours to be produced in a shaft—another has the rest



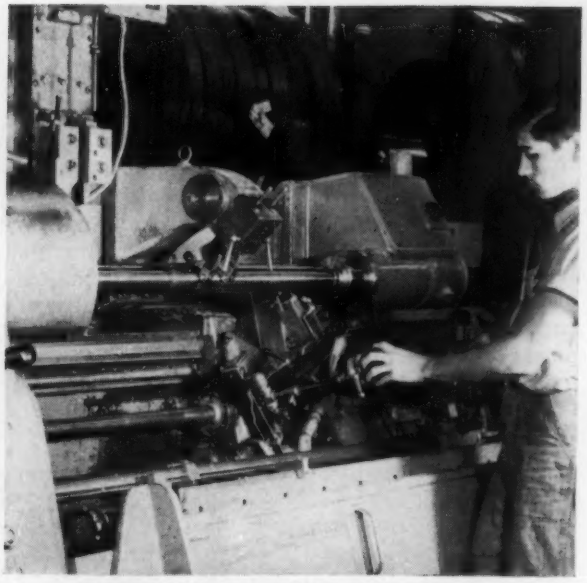
17 . . . FLAT TEMPLETS ARE EASY TO STORE, are frequently used in long-run applications. Contact pressure against the templet is so light that it can be made of unhardened steel in most cases

18 . . . SPECIAL CHIPBREAKERS are common in copying-lathe set-ups where high machining rates require a means of breaking up and removing chips. In this operation, a solid-carbide turning tool is clamped in a rigid holder. Top rake angle, grade of carbide and chipbreaker are all selected to suit the material being machined. Infeed attachment above the work contains grooving tools for plunge cutting while contour turning is in progress



19 . . . MULTIPLE-DIA SHAFT is typical of work turned in copying lathes. Templet does not include form for grooves because these were produced by infeed attachment on copying lathes. Diametral templet dimensions are based on factor of 1.600 plus one-half required dia; axial dimensions are one-to-one

20 . . . TWO CROSS-SLIDES move along the bed of this copying lathe used for contour turning automotive back axles. Each slide has its own copying device—both move at absolutely uniform feed as the result of a servo leadscrew that controls hydraulic feed. The infeed slide turns the flange by means of two tools cutting simultaneously, while a back tool on the right-hand cross slide produces a light finishing cut to hold 0.001-in. tolerance, for size, concentricity and taper. Spindle speed is varied automatically as the infeed slide descends, providing a constant cutting speed. Total machining time for this job is 46 sec, floor-to-floor time 55 sec



21 . . . CONTOUR TURNING AND BORING a thin-wall, hollow shaft about 3½ ft long with a max OD of 3¼ in. is handled in this copying lathe in two setups. AMS 9310 parts are run through to receive multiple diameters on the outside, then set up again—in a collet— for contour boring with a boring bar in the toolholder. Tendency of the workpiece to vibrate is reduced by an open steady-rest that supports the shaft by two pairs of rollers mounted close together. In this way, the shaft can be machined without interruption at the supported area

and finish machining one end of the shafts in a complete run. The shafts are then run through again with the ends reversed so the second templet can produce a different contour. Over 50 different sizes and types of shafts are machined in lots of 25 to 150.

Main part of the Hydra-Trace is a hydraulically controlled compound rest that is interchangeable with the conventional compound rest on the lathe. The compound is operated by the flow of oil controlled by a metering valve actuated by the stylus. Through action of the stylus on the stationary templet, as the compound is driven axially by the carriage feed, the valve directs oil to one side or another of a stationary piston so a cylinder attached to the compound moves in or out, thereby actuating the toolslide according to templet contour. The unit maintains a hydraulically balanced position on the templet, thus providing stepless motion to the tool. Because it can be swivelled to any angle, the device can be employed for either contour turning or facing and, in addition, swivelling permits setting the tool at the best angle for machining the contour.

One shaft run on this equipment is from 3¾-in.-dia SAE 1245 steel bar stock. Rough and finish cuts are made at 318 rpm, with feed of 0.017 ipr. In this case, grinding stock of 0.012 to 0.015 in. is allowed to remain for finishing. Setup time per shaft end is about 15 min — making a total of 30 min for this part, as compared with 8 hr by the former method.

HIGH-VOLUME PRODUCTION

Long-run contour turning, boring and facing jobs are especially suitable for copying-lathe applications for all the reasons previously mentioned for short-run work. Higher speeds, feeds and production rates cut costs to a far greater extent in high-volume production, and of course, tool savings are more noticeable.

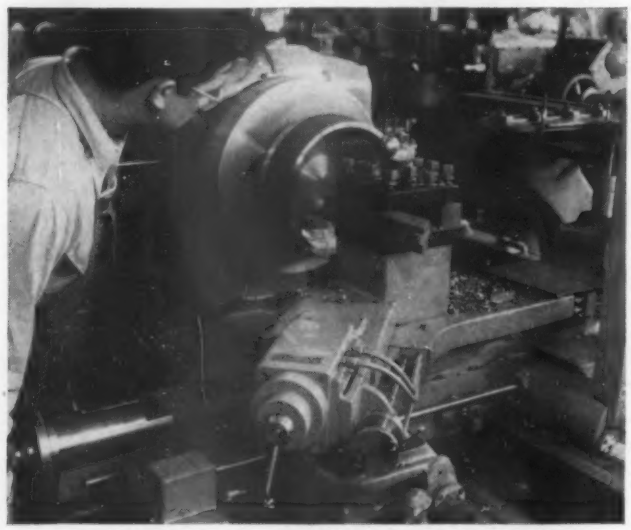
AUTOMATED CONTOUR TURNING

In some instances, automatic copying lathes have been adapted to automation with magazine feeds, loaders, and unloaders (Figs 14, 15). Work comes to three such machines (Fig 14) from Conomatic automatic bar machines where they were cut off, chamfered, center drilled and rough countersunk. A heat-treating operation brings them to a hardness of R_c 30-35, after which the long bore is rough and semi-finish broached, leaving 0.002-0.003 in. of stock for finishing, and the centers are generated concentric with the bore. At the copying lathes, numerous steps are finish-turned on the OD, maintaining concentricity with the bore within 0.001 in. TIR, although

tolerances allow 0.002 in. Cycle time runs about 51 seconds.

Two standard triangular Carboloy 350 inserts are employed, one in the back for facing the end of the shaft at the beginning of the cycle, the other in front for contour turning the length. Special carbide chipbreakers are clamped on these tools, which are locked in special toolholders that permit indexing without losing the setting when they wear. Mounted tangentially to the work, the front tool is in compression, thereby avoiding vibration normally occurring with overhanging radial tools. About 50 pieces can be machined before the tools need indexing, after which three more cutting edges can be used before the tools need resharpening or replacement. When they are replaced, only one or two minutes are required for resetting.

In this setup, the operator does little more than load the hoppers and press buttons. The lathe automatically cycles according to the templet requirements, and short setup time is common because of the simple controls. Carriage feed is accurately regulated hydraulically by a servo leadscrew instead of complicated mechanical or electrical attachments. Motion of this pilot screw, dependent on that of the spindle, maintains a constant relationship between carriage feed and spindle speed for copying. One end of the screw is in constant contact with a hy-



22 . . . ABOUT 23 LB OF METAL ARE REMOVED from rough forgings in contour turning, boring and facing. Floor-to-floor time for this job was 68 min, compared with 340 by conventional methods.

In contour boring, a cross-center technique is employed, eliminating extension tools and providing a high degree of rigidity

23 . . . TWO TRACERS OPERATE SIMULTANEOUSLY to double production in finish contour turning journals, journal dust guards, and radii at both ends of these freight-car axles. Parts are AISI C 1040 steel forgings, and contours are held to plus or minus 0.001 in., thus allowing subsequent plunge grinding without excessive wheel breakdown. Two heavy-duty Monarch lathes, each equipped with dual carriages and two Air Gage tracers, replace engine and center-drive axle lathes and form tools for this job

draulic control valve which regulates oil flow to a piston and cylinder that provides power for carriage travel. The screw meshes with a locked pinion on the carriage, and while the carriage moves at a constant speed relative to the spindle speed, the pilot screw merely turns through the pinion. When the tool meets more or less than ordinary resistance and the carriage speed does not remain constant, the pinion drags or pushes the screw axially against a compression spring at the end opposite the valve. This axial movement thus increases or decreases the valve opening, changing the rate of oil flow to the cylinder which in turn increases or decreases the rate of carriage feed.

CLOSE TOLERANCES, HIGH PRODUCTION

Duplicating attachments on conventional lathes also provide distinct advantages in high-volume production. In one instance (Fig 16), time required for machining shafts nearly 37 in. long with seven different dias, a long taper and six undercuts, was reduced from 273 min each to 38 min. This is done with a Sidney "Fluid Tracer" mounted on a conventional Sidney lathe. The unit has a tracer head that controls a hydraulically actuated crossfeed by a piston at the rear of the carriage directly connected to the crossfeed screw. Longitudinal feeds are selected from the gearbox in the conventional manner and are controlled by a hydraulic clutch and brake mechanism.

Flat templets (Fig 17) are held in a clamping bar between two auxiliary tailstocks while round masters are simply held between centers in these tailstocks. Fine adjustments for positioning the master are made with a graduated dial in the right-hand tailstock which moves the master against a spring-loaded center in the left-hand tailstock.

Various movements imparted to the cutting tool by the tracer head are duplicated to close tolerances. For example, another multi-dia shaft made in this machine had such close tolerance dimensions as a 1.0625-1.0628-in. dia. This part contained six steps, each running a little over 1 in. in dia and a 4-in.-dia flange with a critical length dimension held to 0.375-0.376 in. Other axial dimensions were

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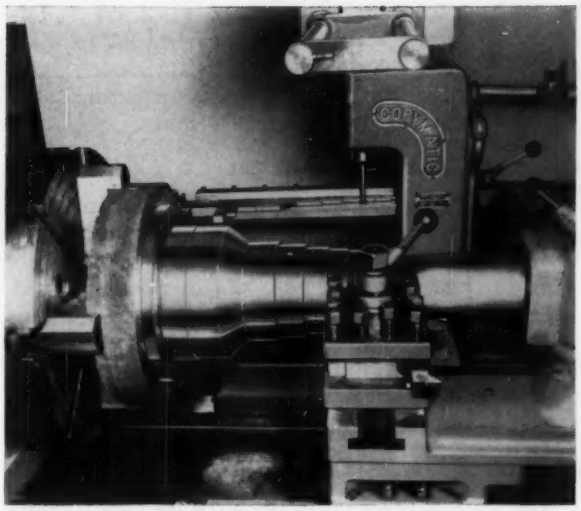
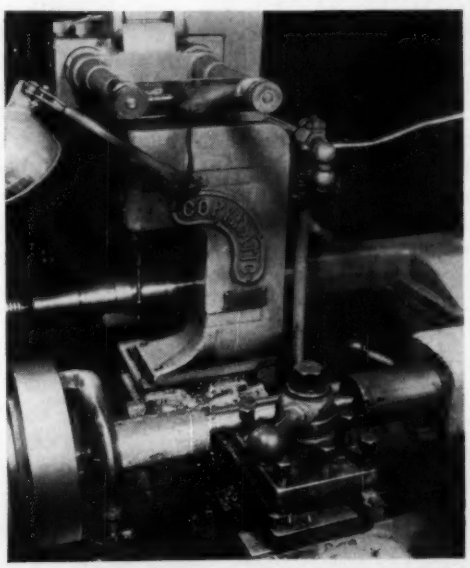
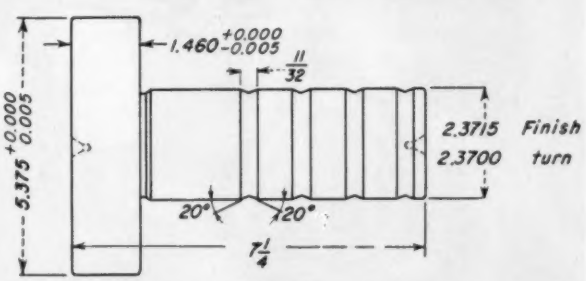
Buick Motors Div, GMC, Flint, Mich
Detroit Transmission Div, GMC, Ypsilanti, Mich
Oldsmobile Motor Div, GMC, Lansing, Mich
Industrial Metal Products Co, Lansing, Mich
The Turchan Follower Machine Co, Detroit, Mich
Saginaw Steering Gear Div, GMC, Saginaw, Mich



24 . . . SAE 1010 CASTINGS WEIGHING 170 LB are contour turned and bored in this setup in 39 min floor-to-floor time—a fourth that by conventional methods. Work is reversed in the lathe for contour boring to produce approximately the same stepped contour inside as it has outside. One flat templet is employed for rough and finish turning, another for rough and finish boring. Tolerances in both setups are held to 0.0015 in.





25 . . . GRINDING IS ELIMINATED by rough and finish turning this pump piston (sketch) in one setup. The entire contour is first roughed, then finish turned with a very fine feed. Surge check studs for hydraulic valves are contour turned between centers in a similar setup (photo), cutting machining time by 50%

held within 0.001-in. tolerances, while diameter tolerances were held around 0.0004 to 0.0005 in. Formerly, 42 min were required to turn each shaft conventionally, whereas with the duplicating setup floor-to-floor time was cut to 8½ min.

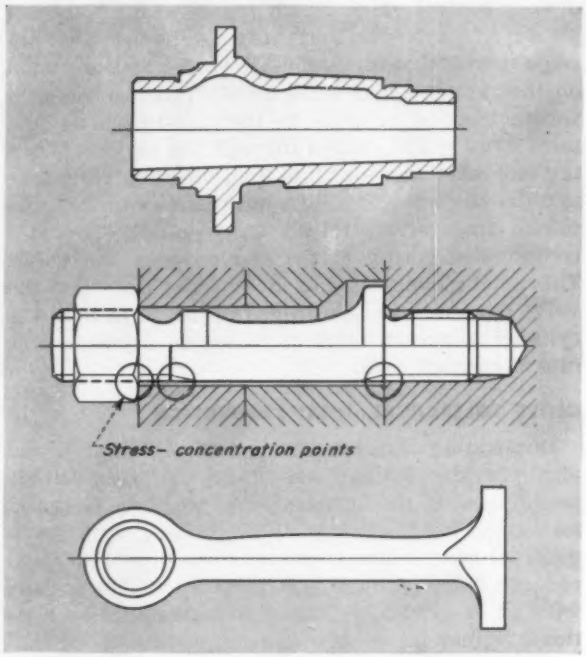
BIG WORK—COMPLEX CONTOURS

Production rates have been increased and machining time cut by contour-turning large cast-steel spindles in a Canadian arsenal (Fig 24). Parts are 16½ in. long with a 12-in. dia at the large end, 5½-in. dia at the small end. A Lodge & Shipley "Copymatic" hydraulically controlled duplicating lathe is used, with the large end of the work held in a 4-jaw chuck for rough and finish turning with the same flat templet. Single-point carbide tools cut at 94 rpm and 0.020 ipr for the first cut, 111 rpm and the same feed for the second.

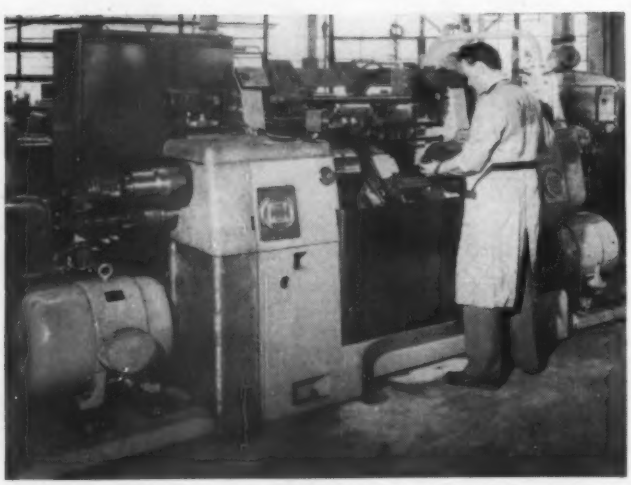
The work is reversed in the lathe for contour boring, chucked on the large dia for good support and alignment, with the small end of the piece inserted in an 8⅞-in.-dia hole in the spindle. In this operation, the part is rough and finish bored, again using a flat templet and carbide tools. Threading and facing follows in a conventional manner in the same setup.

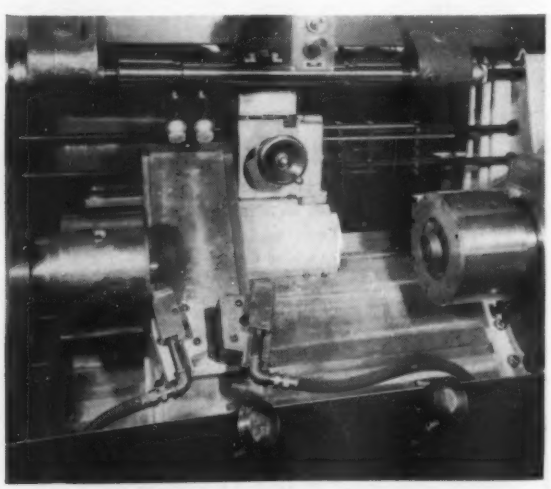
GRINDING ELIMINATED

Another close-tolerance job in a Copymatic is contour turning radial-pump pistons (Fig 25—sketch) directly to required dimensions within 0.0015 in. In this case, with the part held between centers, the entire contour is rough turned with a feed of about 0.012 ipr. A fine feed is then used in the same setup for finish turning to eliminate former grinding. Material is SAE 3130 heat-treated steel and, of course, carbide tools are employed at high speeds. A 3.375-in.-dia flange at one end is held to plus zero minus 0.0005 and is 1.445 plus zero minus 0.0005 in. Over-all length of the piston is 7¼ in. and the body dia is 2.3715-2.3700 in., broken by four equally spaced radial grooves.



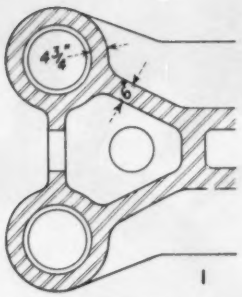
26 . . . PRODUCT DESIGN HAS BEEN IMPROVED and simplified by the use of copying lathes. Weight saving, for example, with walls of uniform thickness by means of corresponding internal and external contours is gained without important cost. Stress concentration points are avoided in parts subject to heavy alternating loads, and the ideal profile based on the strength of the material is accomplished without machining difficulties



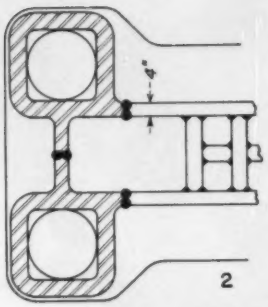


27 . . . DOUBLE HEADSTOCK on this copying lathe provides same production as two lathes in the floorspace of one. Operator loads one head while the single slide moves into the other for machining another part. Double-end round templet is held between centers—slide is moved from one end to the other to cut external contours on these automotive castings

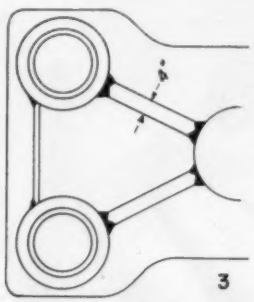
MANUAL WELDERS deposit 4.5 lb of weld metal per man-hr in deep-groove welding. Note arrangement of continuous preheater



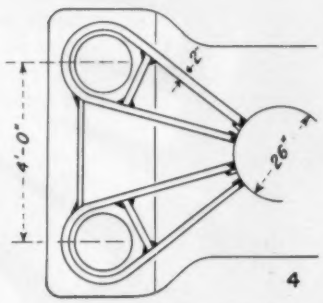
1. ORIGINAL DESIGN called for heavy casting for press crosshead



2. COMBINATION OF CASTINGS and plate involved too many and too difficult welds



3. RADIAL-WEB WELDMENT required fabricating cylinders and heavy welding



4. WRAP-AROUND DESIGN in lighter plate eliminated cylinders, reduced welding by 25%

Don't copy the old pattern when you...

DESIGN FOR WELDING

GORDON CAPE, welding & research engineer, DOMINION BRIDGE CO LTD, MONTREAL, QUE, CANADA

Creative imagination, backed by sound engineering knowledge, went into the design and fabrication of the crosshead for a 4500-ton press at Dominion Bridge Co, Ltd, Lachine, Canada.

This crosshead was originally designed as a cast-steel unit but, after considerable development work, a 28-ton steel-plate weldment was produced at great saving to the customer.

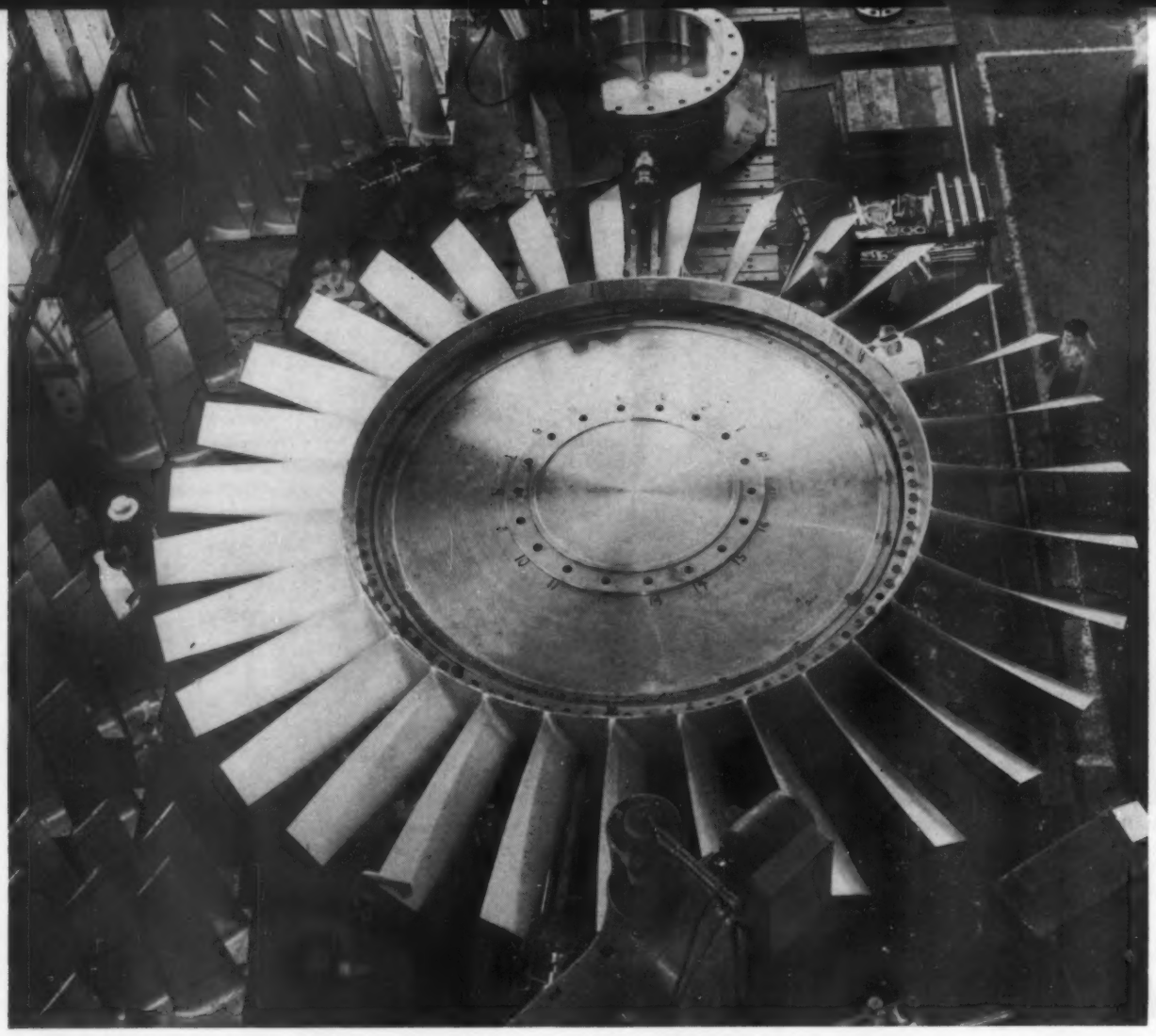
Accompanying sketches show: 1. a horizontal section through the original casting, and 2. a design suggested by the customer's engineers which combines castings with steel-plate webs and cover plates. Certain disadvantages in this design, such as the large number of joints to be welded and the practical difficulties of welding in almost inaccessible places, were overcome by a return to the radial-web idea, 3. In this design, castings were replaced by formed steel cylinders and the center hub by a solid steel forging. A hollow forging would have afforded less weight but, at the time, was unobtainable.

However, there were still disadvantages in this design. The forming of the steel cylinders would require new and expensive dies. Being in two parts, each cylinder would require two heavy longitudinal joining welds. Very large welds would be involved in joining the 4-in.-thick radial webs to the hub and to the corner cylinders.

The final design, 4, shows the weldment eventually fabricated. Disadvantages of the previous design have been largely eliminated by the substitution of a continuous bent plate 2 in. thick. There are now no corner cylinders to be formed and welded. Using two 2-in. plates in place of the 4-in. radial web gives a reduction in welding of approximately 25%.

PREPARATION AND FABRICATION

Preparation of components presented no particular difficulties. Welding, however, was more complicated and required strict adherence to predetermined operating procedures. All welding was done with the base metal held at a minimum pre-heat temperature of 350 F. Welding radial web plates to the hub was done first with the hub mounted on a rotating fixture. Multipass submerged-arc welding was used. After stress-relieving and fitting of the cover plates, welding around the circular hub was completed. Manual arc was used here and on all subsequent welding of webs to cover plates. Altogether, 2000 lb of electrode were used, 1500 of which were applied manually.

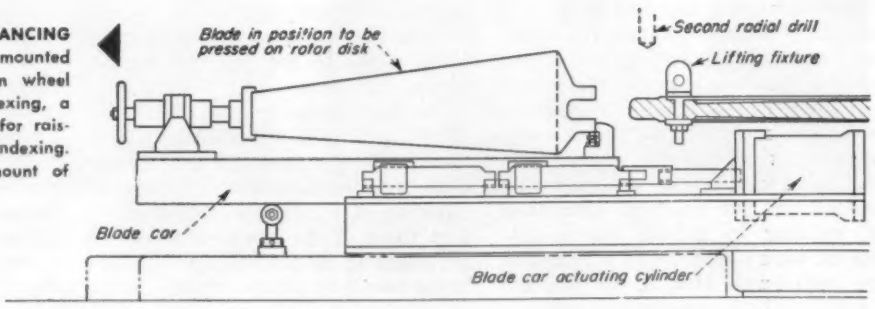


WEIGHING NEARLY 41 TONS with all blades attached, this 31-blade disk for one of the five rotors used in the large axial-flow compressor at the Tullahoma wind tunnel was assembled and checked for balance on a special fixture developed by Westinghouse

One setup blades and balances wind-tunnel rotors

No ordinary balancing machine could handle these huge compressor wheels, so a special machine was built to combine both assembly and balancing operations

FIXTURE FOR ASSEMBLING AND BALANCING bladed disks consists of a 7-ft-dia table mounted on a spherical seat. Table has worm wheel and retractable worm for precise indexing, a locking cylinder and a lifting cylinder for raising disk off supporting rollers while indexing. Two precision dial gages measure amount of unbalance


Blade in position to be pressed on rotor disk
Second radial drill
Lifting fixture
Blade car
Blade car actuating cylinder

H J BAKER, mfg engineer, PACIFIC COAST PLANT, WESTINGHOUSE ELECTRIC CORP

Each consisting of from 3 to 6 blade-disks, five rotors are being machined at the Westinghouse Plant, Sunnyvale, Calif, for axial-flow compressors to be installed at USAF's new propulsion wind tunnel near Tullahoma, Tenn, (*AM*—July 19 '54, p142). Two of the rotors and compressors have already been completely machined and assembled for test prior to shipment, but the various components are so large that they must be shipped disassembled, and can be given final tests only after installation at the wind-tunnel site.

Each of the 21 disks is 17 ft 7 1/2 in. OD, and the tip diameters of the bladed disks vary from 30 to 21 ft. Disks are made from forged alloy steel and weigh approx 23 tons. Blades are machined from 12% chrome-alloy steel forgings and vary from 31 to 89 per row. The longest blade is more than 7 ft over-all and weighs 1200 lb.

Balance of the assembled rotors is critical, as they operate at speeds up to 600 rpm in developing the transonic and supersonic air speeds needed. But balancing equipment capable of handling 30-ft-dia assembled disks and rotors was not available.

Solution was a combined disk assembly and balancing table so sensitive that a 50-cent piece placed on one side of the 23-ton rotor disk would register an unbalance on the precision dial indicators placed 180° apart and just inside the blade root.

The 7-ft-OD table is mounted on a spherical seat that is put under hydraulic pressure during balancing operations. It is also equipped with a hydraulically actuated pin for locking during during machining operations, and with a piston for raising the disk from rim-supporting rollers while balancing. Under the table is a wormwheel and a retractable worm for indexing.

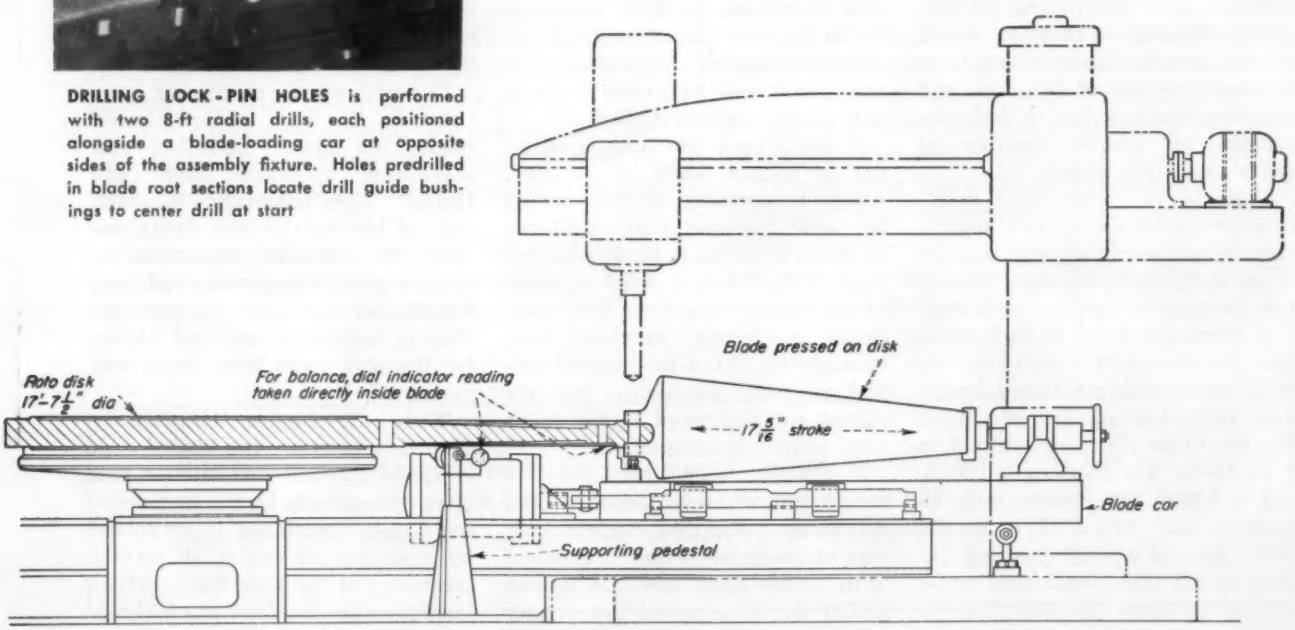
There are two blade-loading cars, positioned on opposite sides of the table. Base of one car is fixed but, as all disks have an uneven number of blades, the base of the second car is adjustable angularly for alignment to permit setting two blades at a time. Each car is equipped to hold a blade level and radial on the centerline of the rotor disk, and to hold the root end against the rim with a constant force of 2000 lb while mounting-pin holes are drilled, bored and honed to size. When finally assembled, three 3-in.-dia pins are expansion-fitted (by subzero cooling) with 0.001- to 0.0015-in. interference in these holes to lock the blades to the disks.

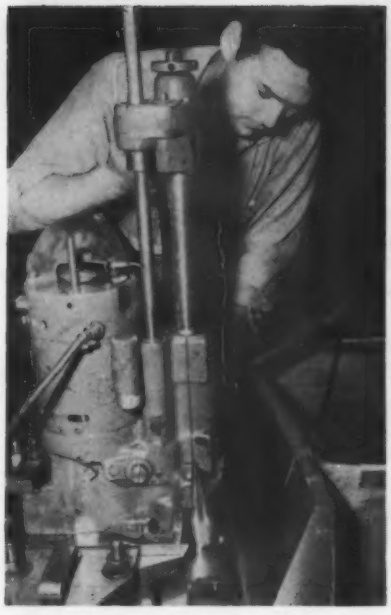
Sequence of operations for blading and balancing is:

1. Serially numbered blades are weighed and recorded.

2. Disk is positioned on fixture table and checked for balance

DRILLING LOCK-PIN HOLES is performed with two 8-ft radial drills, each positioned alongside a blade-loading car at opposite sides of the assembly fixture. Holes predrilled in blade root sections locate drill guide bushings to center drill at start





PORTABLE BORING BAR powered with ½-hp motor finishes lock-pin holes to 2.998-in. dia, leaving approx 0.0005 to 0.0015-in. stock on dia for honing operation which follows. HSS tools are used for rough boring operation, carbide bits for finishing

LOCK-PIN HOLES, 10½ in. deep, are finished to size with a portable honing head, driven through a universal joint by a portable electric drill. Finished size leaves an interference fit 0.001 to 0.0015-in. under 3-in.-dia pin later fitted into hole

EACH LOCK-PIN HOLE is air gaged after honing, and size is recorded for later selection, in field, of pin that will provide correct interference fit. Split expansion pins are placed in two outside holes of each blade as disk assembly is built up, to hold blades in place until balance of assembly can be checked and corrected

One setup blades and balances wind-tunnel rotors . . . continued

with precision dial indicators at four positions. Readings are recorded for reference.

3. Records of blade weights and disk unbalance are sent to the engineering dept where assembly positions are determined for the blades. Blades of nearest equal weights are assigned to positions on opposite sides of the disk, and consideration is given to disk unbalance by proper location of heavy and light blades.

4. Blades of correct serial numbers are placed on the two loading cars and advanced against the rim of the disk, which has been located and clamped according to layout.

5. Three pin holes in each blade root are drilled to 2 15/16-in. dia with radial drills positioned beside each blade-loading car. Pin holes in each blade are premachined to 2 15/16-in. dia halfway through, and 2 3/4-in. dia from center to opposite side. The 2 15/16-in. dia hole locates a drill bushing for starting a 2 3/4-in.-dia drill while drilling through the disk. Then a 2 15/16-in. dia core drill finishes the hole all the way through the assembly. Because the head of the drillpress must be extended to the full length of the radial arm to clear the long blades, it is necessary to reduce hook of the drill lip to 3°, end clearance to 2° to eliminate chatter. Expanding pins are placed and tightened in each hole as soon as it is drilled.

6. Next, each pin hole is bored out to within 0.002 in. of size, using a portable power boring bar with catspaw support blocks to guide it in the hole. The boring head is bolted to a riser clamped to the rim of the disk. This produces a round, straight hole through the 10 1/2-in.-thick blade-disk assembly. Expanding pins are placed and tightened in the holes after boring is completed.

7. Finally, each pin hole is honed with a special portable head driven by a portable electric drill. Size of the finished hole is checked with an air gage, and size within 0.0001 in. is recorded for proper selection of interference-fit pin to be "expanded" into the hole at final assembly in the field.

When the three holes in each blade are completed, two split expansion pins, each ground 0.003 in. smaller than the hole, are fitted and tightened in the two outside holes of the blade.

Except when machining the holes in the last, odd-numbered blade, the above mounting and machining operations are performed simultaneously in each pair of blades, the disk being rotated 90° between operations so weight on the supporting table is distributed as evenly as possible. This is continued until all blades for the disk have been fitted and machined.

With all blades temporarily pinned in position, the bladed disk is again checked for balance and charted for study by the Engineering Dept. Unbalance is corrected by grinding off metal at correct locations, or by specifying extra-long pins for the final assembly.

Round Table

And.....they're off!!

"Hey, Al, what's all this about Edwards winning a monster baseball pool? I thought you knew gambling in the plant was strictly against the rules."

"Oh, get off your high horse, Ed. A little baseball pool isn't going to hurt anyone. Besides, it only amounts to a few bucks."

"You're looking for trouble, Al. I've seen these things grow up from little pools into really big deals. First thing you know, your gang won't have time for work because it interferes with the numbers, or with listening to the races."

"This is just a small department pool, Ed. I realize that a big gambling trend would have to be stamped out; but the baseball season is nearly over, and it'll die out."

"Sure; baseball will, but how about football, then basketball, and then next year's early baseball games? There's always fights, too."

"You're blowing this thing up all out of proportion, Ed. A bit of gambling keeps their sporting blood busy—probably keeps them from getting into more dangerous trouble."

"It's not harmless fun, Al. I've seen these things grow, and that's why the company has it in the rule book—'no gambling of any kind.'"

"I'd rather have the men gambling openly, Ed. At least I know what's going on."

"Sure, but the men know the rules, too; and they'll think they can get away with more. If you're lax about this, you may be lax about something else. You're cutting your authority out from under your own feet."

"I can control them, Ed. In the meantime, why should I make a stinker out of myself by breaking up this little pool?"

"Better to make yourself a stinker than get top management mad at you."

***ARE POOLS** really harmless fun, or the seeds of real trouble? Should Al step on the men now to make sure they respect his authority, or should he let them have their fun? Your opinion may help others with similar problems. Discussions of earlier topics start on page 200*

If you use the proper technique, you can...

WELD LOW-ALLOY STEEL TO STAINLESS

You can save a lot of money and conserve scarce materials by spot or seam welding SAE 4130 to SAE 51410. And you can do it in the hardened condition, then stress-relieve the entire assembly

KARL DORSCHU, Metallurgical Section, Aviation Gas Turbine Div, WESTINGHOUSE ELECTRIC CORP, KANSAS CITY, MO

With continuing emphasis being placed on saving such critical alloying elements as Cb, Co, Ni, Cr, and W, the use of low-alloy steels for gas-turbine components has been steadily increasing. Because of their high strength and high degree of hardenability, they are now being used in place of stainless steel where engine operating temperatures do not exceed 1100 to 1200 F.

However, because of the high hardenability of such materials as 4130, NAX, and 1722A(S), joining by welding becomes a problem. And because many of the welded parts are too complex to be hardened as a unit, it is desirable to harden and temper unit components which are to be seam and spot welded into a final assembly.

However, if each part could be hardened and tempered, welded to make a unit, and then the unit tempered again (to reduce brittleness in the weld and adjacent zones), the problem of cracking and distorting the unit during hardening would be overcome.

With this in mind, a series of tests was made with SAE 4130 as the low-alloy steel, and SAE 51410 (12% chromium) as the stainless to which the first steel was to be joined by both spot and seam welding. First tests were made with 0.050-in. annealed 4130 welded to itself, then to 0.050-in. annealed 51410, followed by 0.050-in. annealed 51410 welded to itself. These tests were then repeated in the same sequence, using the same materials in the hardened and tempered condition.

It was found that welds were entirely successful, but it appeared that it was desirable to use longer weld time sequences for spot welding hardened and tempered 12%-chromium stainless steel to itself, and to hardened and tempered low-alloy steel. Because the hardened and tempered low-alloy steel has an electrical resistivity below that of the stainless, the use of Elkonite tips against the low-alloy steel would seem desirable to maintain a better heat balance when producing the nugget in the combinatioin. However, Elkonite tips were found to cause considerable sticking, although no difficul-

SEAM WELD of hardened and tempered SAE 4130 and SAE 51410. Nugget and melted grain boundaries appear to be white martensite, darkened areas tempered martensite. Note grain boundary melting in low-alloy material adjacent to nugget. Material is in as-welded condition. Nital 5% etch, 250X.

TABLE 1 ... *SPOT-WELDER SETUPS*

Combination Welded	Heat Treatment Before Welding	Time Sequences			Secondary Current		Force in Pounds Electrode	Electrodes
		Squeeze (Cycles)	Weld (Cycles)	Hold (Cycles)	Through Copper (Amp)	Through Material (Amp)		
SAE 4130 to itself	Annealed	55	15	50	9450	7600	1300	RWMA Class 3. 3/8-in. dia face dressed to 6-in. radius.
SAE 4130 to itself	Hardened and tempered. (1100 F for one hour)	55	15	50	9030	7450	1300	Same
SAE 4130 to SAE 51410	Both steels in annealed condition.	50	23	50	9030	7430	1325	Same
SAE 4130 to SAE 51410	Both steels in hardened and tempered condition. SAE 4130 tempered at 1100 F for 1 hr. SAE 51410 at 1200 F for 1 hr.	50	23	50	9030	7430	1300	Same
SAE 51410 to itself	Annealed	50	18	50	9030	7430	1300	Same
SAE 51410 to itself	Hardened and tempered at 1200 F for one hour.	50	18	50	9030	7430	1300	Same

ty was encountered when standard class 3 (RWMA standards) electrodes were used.

Referring to Table I, note that the setups used to weld the combinations in the annealed condition were essentially the same as those used in the hardened and tempered conditions.

It can be seen in Table II that adequate tensile and tensile shear strengths are developed from these joints. Ductility ratios are relatively low and are typical of hardenable steels. It should be noted, however, that the ratios are lowered considerably because of the high tensile shear strengths in the hardened and tempered spot welded joints. The ductility of spot-welded joints is usually measured by considering the ratio of tensile to tensile shear strength of the joint. This 'ductility ratio' varies generally from 0.1 to 1, the higher values being indicative of greater ductility. It is virtually impossible to design joints taking loads in shear only, so tensile strength and ductility ratios are of practical value in the investigation of the joint for engine use.

Seam welding of the previously enumerated combinations was equally successful. Welding hardened and tempered low-alloy steel to itself shows a lower secondary current than does the annealed material, as was the case in spot welding. Hardened and tempered low-alloy steel, seam welded, shows a tendency to produce voids which are difficult to eliminate, even with relatively high wheel forces. However, since failures usually occur at the periphery of the nugget in actual engine operation, the voids are allowable if not too close to the periphery of the nugget (within 15% of the diameter).

When seam welding low-alloy steel (hardened and tempered) to 12% chromium stainless (hardened and tempered), gain boundary melting occurs in the low-alloy parent material. This phenomenon gives the appearance of cracks when viewed on a 'macro' basis in the shop. A careful inspection of the weld will show this to be melting rather than cracking.

Low-alloy welds can be etched with acidulated ferric chloride in the shop, by brushing over the polished surface until the weld appears. Rinse off with water.

From the results of these tests it is evident that no difficulties should be experienced in welding hardened and tempered low-alloy steel to itself and to 12% chromium steel, hardened and tempered. Heat treating at 1100 F for 1 hr effectively reduces the peak hardness and tempers the weld. Also, hardened and tempered 12% chrome steel can be successfully welded to itself, if such welds are tempered at 1200 F for 1 hr to reduce peak hardness. Hence, complex units can well be made without hardening after welding.

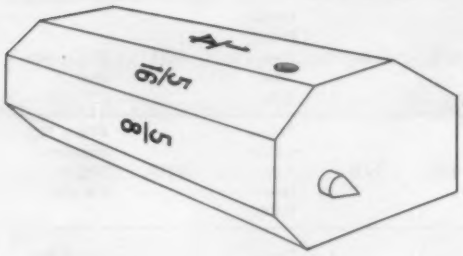
TABLE II ... PROPERTIES OF SPOT-WELDED JOINTS

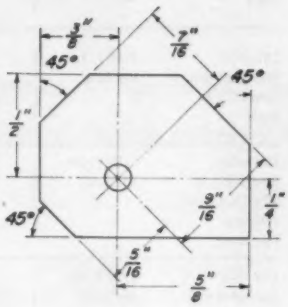
Combination Welded	Heat Treatment After Welding	Tensile Strength	Tensile Shear	Ductility Ratio	Mode of Fracture	Nugget Dia. in.	Penetration
Low alloy (annealed) to itself	1100 F. for one hour	824	3000	0.275	Tensile: Button. Shear: Button.	0.216	75% in each sheet
Low alloy (hardened and tempered) to itself	1100 F. for one hour	768	2958	0.260	Tensile: Button. Shear: Shear Type.	0.205	75% in each sheet
Low alloy (annealed) to 12% chromium stainless. (annealed)	1100 F. for one hour	670	2642	0.253	Tensile: Tension Type. Shear: Button.	0.215	60% in 12% chromium 57% in low alloy
Low alloy (hardened and tempered) to 12% chromium (hardened and tempered)	1100 F. for one hour	530	3100	0.171	Tensile: Tension Type. Shear: Button.	0.215	65% in both 12% chromium and in low alloy
12% chromium (annealed) to itself	1200 F. for one hour	770	2250	0.342	Tensile: Button. Shear: Button.	0.215	60% in each sheet
12% chromium (hardened and tempered) to itself	1200 F. for one hour	955	2565	0.372	Tensile: Button. Shear: Button.	0.215	63% in each sheet

TABLE III ... SEAM-WELDING SETUPS AND RESULTS

Combination Welded	Heat Treatment Before Welding	Time Sequences		Secondary Current		Wheel Force lb	Wheels Used	Nuggets per in.	Penetration
		Weld (Cycles)	Cool (Cycles)	Through Copper Amp	Through Material Amp				
Low alloy to itself	Annealed	20	17	8100	6700	2000	8-in.-dia ½-in. width dressed to 6-in. radius RWMA Class 2	11	60% in each sheet
Low alloy to itself	Hardened and tempered (1100 F. for 1 hr)	20	17	7000	5600	2000		11	50% in each sheet
Low alloy to 12% chromium stainless	Both annealed	20	17	6700	5300	2000		11	45% in each sheet
Low alloy to 12% chromium stainless	Both in hardened and tempered condition	23	18	6700	5300	2140		11	55% in each sheet
12% chromium to itself	Annealed	23	18	6700	5300	2140		11	50% in each sheet
12% chromium to itself	Hardened and tempered	23	18	6700	5300	2200		11	50% in each sheet

Practical Ideas . . .





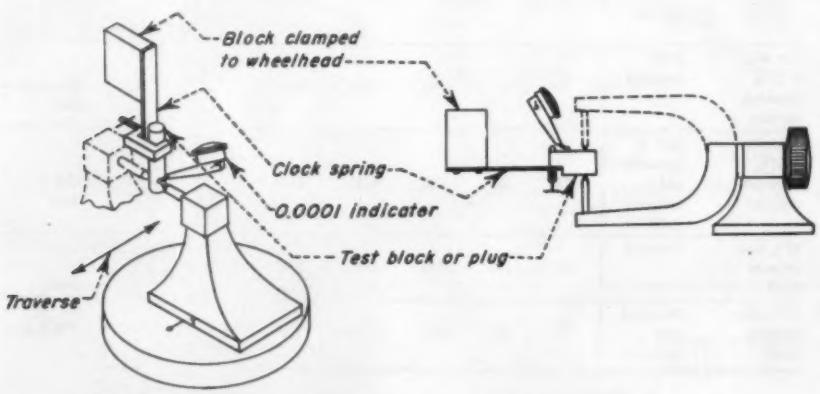
Seven-Sided Prism Speeds Rough Toolmaking Layout

Toolroom work has a number of simple, repetitive operations, which most toolmakers do as carefully as they would the finished surfaces, even when this care is not needed. To cut down on the time for one of these operations — rough layout — we have made a number of preset height gages. There are two units to these gages, one of which is shown here. It consists of a seven-sided prism. A hole through the block contains a conical scriber made of tungsten carbide, held in place with a setscrew.

The block is easy to make by laying it out and drilling and reaming the hole right through. Then the block is shaped to approximate size and hardened. A pin is inserted in the hole and allowed to project on each side. By resting this pin on top of the jaws of a toolmakers' vise, and gripping the block between the jaws, the faces can be ground one at a time to the correct distance from the pin. The angles do not have to be held, as they do not affect the function of the tool.

The faces of the tool are marked to correspond to the distance of the scriber from the opposite face. The tool as shown is ready to mark a line ¼ in. from the lower face. The second block of the set (not shown) is made with seven faces, spaced from 11/16 to 1 1/16 in. from the scriber, in increments of 1/16 in. A 1-in. parallel can be used below the blocks for marking lines over 1 1/16 in. The addition of 1/64-in., 1/32-in., ⅛-in. and 3/16-in. shims completes the set, and permits the tool to scribe a line from ¼ to 2¼ in., in 1/64-in. increments.

This tool is not intended as a substitute for the height gage, but is an auxiliary tool for use when great accuracy is not needed, permitting very rapid layout. *Clifford Molloy, Bronx, NY*



Leaf Spring and Plug Help Set Diamond Radius Dresser

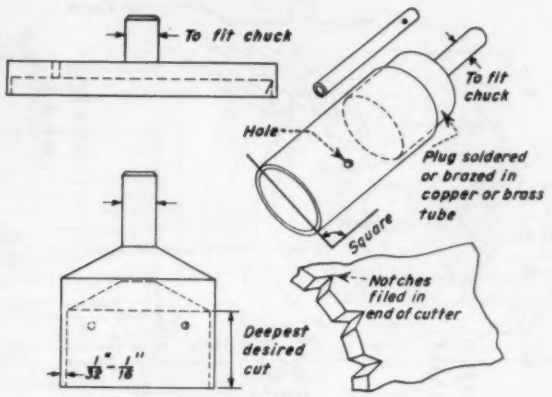
This simple attachment is very helpful when setting a diamond to dress an accurate radius on a grinding wheel. The device is basically a leaf spring to which is clamped a plug or block whose thickness is exactly twice the radius desired on the wheel.

The leaf spring is clamped to the wheelhead, and the plug is clamped to the lower end of the leaf. A 0.0001-in. indicator is also fastened to the wheelhead and brought to bear on the plug.

The radius is set as closely as possible, and the diamond is brought into contact with the plug just below the indicator. Then the diamond is traversed across the plug and the indicator movement is noted. The diamond is rotated 180° and again traversed across the plug. The diamond is moved until the indicator movement (in opposite directions) is the same for both positions.

With this method we have successfully done some very difficult tool work.

The method was developed to avoid the annoying problem of having to measure across the diamond, which must be done when setting certain kinds of conventional radius dressing attachments. *R L Levy, Westerly, RI*



DETAILS of cutter construction

Abrasive and Cutter Make Holes In Glass

Every so often the problem comes up in the shop of making large holes in glass, such as a finger hole in a sliding glass panel or door, making replacement mirror disks for truck rear-view mirrors, new lenses for portable lights, or the round "speaking" hole for the cashier's window.

Large holes and disks from ⅛ in. to 5 or 6 in. in diameter are easy to cut with a lathe, drillpress, or electric drill. The secret is to let abrasive do the work.

Start by making a cutter or lap, from copper, brass, or cast iron. The cutter should be a tube with a wall thickness of 1/32 in. to 1/16 in. Solid cutters will work, but these must wear away the whole cutter area in the glass.

Cutter diameters from ⅛ in. to 1 in. or so are made from 2-in. lengths of copper or brass tubing. If the OD is larger than the chucking capacity of the drill or lathe, put a plug turned to chucking size in one end of the tube. Braze or solder it in place.

Larger cutters can be turned out of larger material to fit your needs. The thickness of glass that can be cut is limited only by the length of the cutter. (Note the hole cut through 2-in.-diameter glass rod in the photo.)

For cutting glass, use a powdered abrasive, about 100 grit, or valve grinding compound. Mix the abrasive grains with water to make a thin paste. Apply the mixture freely to the cutter. It helps to drill a hole in the side of the cutter, so air pressure will not build up inside. Also, the hole allows you to remove the disk cut from the glass. (The abrasive can be applied through the hole, also.) If the abrasive covers too large an area, a dam can be built around the cutter with putty or caulking compound.

Revolve the cutter at slow speeds and feed it into the glass with short light strokes, avoiding too much pressure. For fast cutting, keep a liberal supply of abrasive under the cutter.

Flat glass is best held on a drillpress table by putting a flat wood block under the work, another on top. Then carefully clamp these to the table with a C-clamp. *Phil McCafferty, Stanwood, Iowa*

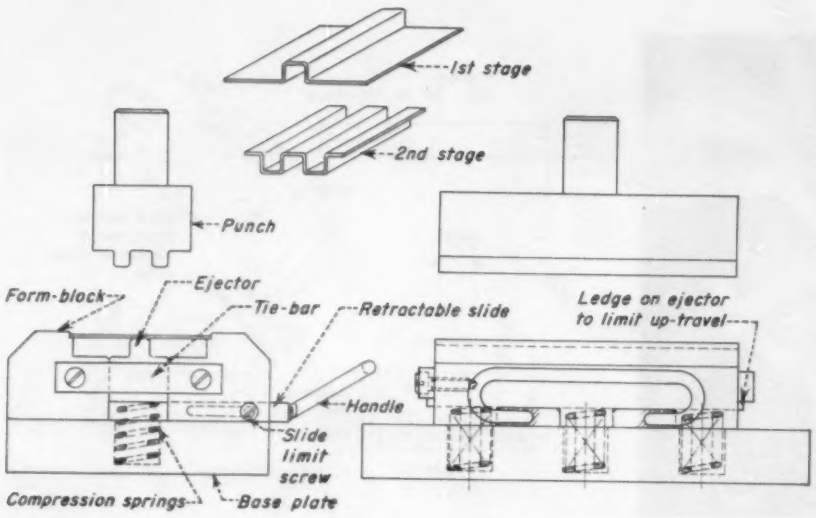
Dropper Aids Dye Application

I am a tool inspector in a company in which it is policy to furnish layout dye whenever needed. The dye is bought in quart or pint cans, from which the workman fills a small bottle or other container.

This causes a mess when applying the dye, whatever is used as an applicator. We used to use small paint brushes, cotton swabs, and even match sticks, but the brushes would dry out overnight, and the swabs and sticks would drip while they were being used. Some makers furnish dye in cans that have a brush attached to the top. This is a great improvement, but you still have to dip and paint, so the cap is soon covered with a thick deposit, causing trouble taking the cap off and putting it back on.

One day I tried using an empty Murine bottle as my container, spinning a bit of cotton on the end of the eye dropper as a spreader. I found that the dye readily pulled up into the dropper, and, when it was loaded this way, I could swab a surface as large as a square foot without refilling.

The idea caught on rapidly and is now quite common in the shop. We have had a run on Murine ever since, and there is a waiting list for empty Murine bottles. *Frank Buczkowski, Detroit, Mich*



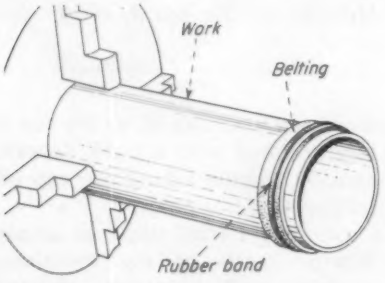
Two-Stage Bending Tool

To eliminate two form-tools and the necessary handling time to form the double U-shaped component shown, we built the form tool shown here, cutting down floor-to-floor time considerably by combining all stages of the operation. The tool is used on an ordinary fly-press.

To form the first stage, the retractable slide is pushed to the left, where it acts as a stop for the ejector which also forms the reverse U-shape.

The slide is then pulled back to allow the second stage to be formed. The component is then ejected, and the slide pushed forward for the next piece.

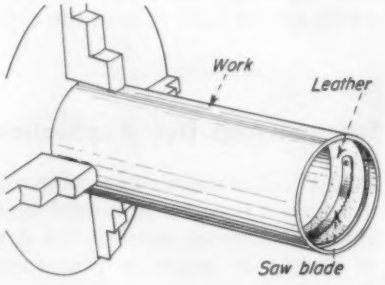
Of course, this tool is not limited to the double U-shape shown, but can readily be adapted for various other forms. *Herbert H Fronicke, Somerset, England*



Leather Absorbs Vibrations

This idea will help a lot of lathe hands, even though it looks pretty odd, at first. One really has to try it to appreciate it.

When machining long thin bushings, there is always a tendency to get tool chatter. We have tried various things, such as changing feeds and speeds, and grinding the tool to a point, but none of these helped enough.



Having read that leather absorbs vibrations, we tried this method: For boring, wrap an old leather belt around the far end of the bushing and hold it in place with string or a rubber band. For turning, wrap the belt on the ID of the work, holding it with a piece of worn out hacksaw blade.

Surprisingly enough, this completely stopped the chatter. *Joseph A Raczkiewicz, Pittsburgh, Penna*

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ISSUE OF JUNE 20, 1955

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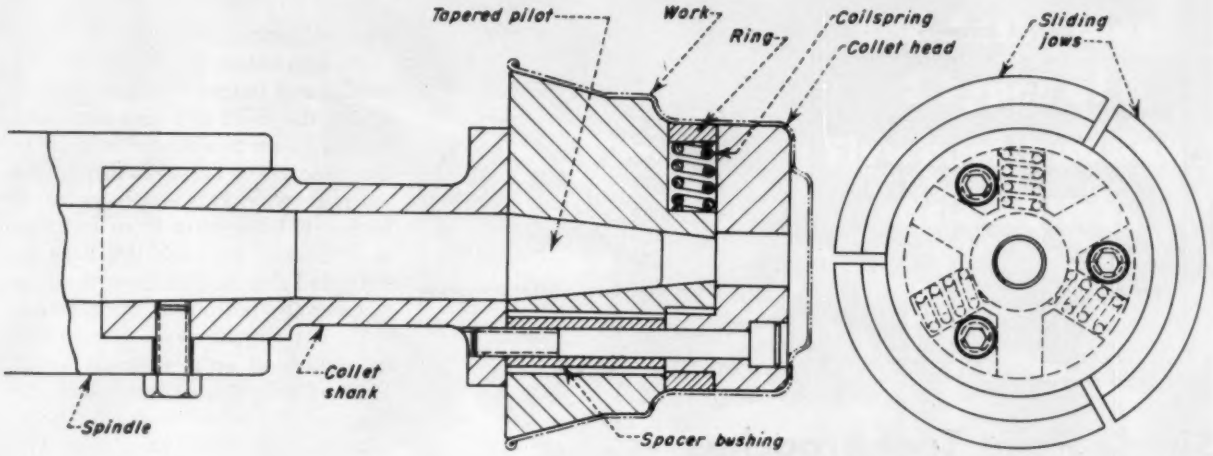


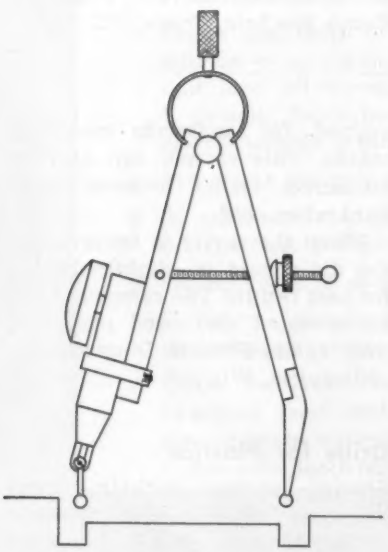
Expanding Mandrel Holds Cup For Curling

This device is an expanding mandrel which was designed for holding a sheet metal cup for a curling operation on a lathe. We had tried several conventional mandrels for this job, but none of them had stood up well enough for the work.

The mandrel head is held together by three screws. Three coilsprings hold sliding jaws against a tapered pilot which fits the center of the mandrel head. The springs are retained by a ring.

The three spacer bushings on the screws are a trifle longer than the shoulder of the jaws, so the jaws can slide or move radially as much as the holes in the jaws will permit.

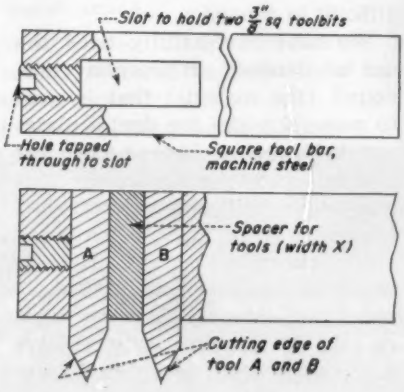
When the tapered pilot is moved to the right, the three sliding jaws expand and lock the work in place. Then when the curling operation is finished, the pilot is withdrawn. The springs force the jaws away from the work, which can then be easily removed. *Hjalmar Dahl, Upplands Vasby, Sweden*



Indicator On Dividers Gages Work On Surface Grinder

When grinding parts to close tolerances on a surface grinder, we find it is useful to mount an indicator on a divider, as shown here. The indicator is set to size with gage blocks, and the parts can then be gaged without taking them off the chuck.

Previously, the only way we could get a reading was to take the part off the chuck and set it up on a surface plate, which took quite a bit of time. *Arnold Koch, Milton, Ontario, Canada*

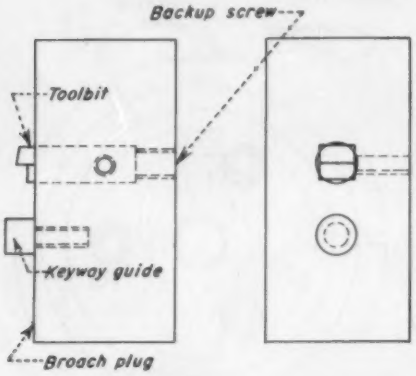

Slot to hold two 3/8" sq toolbits
Hole tapped through to slot
Square tool bar, machine steel
Spacer for tools (width X)
A
B
Cutting edge of tool A and B

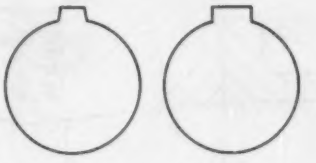
Two-Toolbit Holder Eases Cutting Large Threads

We were having trouble cutting 2-in. ANC threads (internal) on an engine lathe not fitted with a compound rest, because the tool caused tearing on the finishing cut. We could not eliminate the trouble with a good quality tap.

The problem was solved by making the toolholder shown here. The thread form was completed only after both tools had finished cutting. The forward tool cut the front of the thread, and the rear tool finished the back part. Each tool was ground 5° to 8° top rake.

The pitch of the tools is determined by the spacer, using a master tap as a templet over the cutters. The tool can be used for other pitches and thread sizes by changing the thickness of the spacer. *C R Saville, Warwickshire, England*





Single-Point Tool Broaches Keyway in Large Pulley

We recently had a problem in the shop of repairing a badly worn keyway in a large brake pulley. We were not equipped with a broaching machine, and setup on our small planer would have been too involved and questionable. Even the old time method of using a boring bar on a lathe carriage, working the tool back and forth, was discarded because of the setup and alignment involved with the bulky piece.

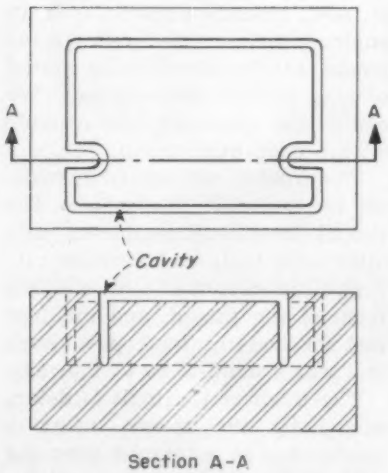
We finally worked out the method shown here. We first turned a plug to fit the bore of the work with little clearance. In the center of the plug we drilled a hole a little smaller than the diagonal dimension of the toolbit to be used. The bit was then forced through the hole to cut four shallow corners, which then acted as a guide. The back of the hole was threaded for a short distance, and a setscrew was inserted, so that when turned, it would force the tool out into the work. This also provided positive support against back pressure on the toolbit. A locking setscrew was inserted from the side of the block.

An inch below the toolbit hole we drilled and tapped a hole to receive a bolt, the head of which had been turned down to a diameter exactly the same as the *bottom* width of the worn keyway. This acted as a guide to prevent the plug from twisting as it pushed through the bore. It extended just enough from the plug to clear the bottom of the keyway.

To cut the keyway, the toolbit is backed off so it will cut about 1/16 in. into the keyway, and the plug is pushed through the bore, with the guide in the lead. The toolbit is then moved out by the setscrew and another pass is made. This is repeated until the desired depth is reached. The plug should extend into the bore by at least its own diameter before any cutting is done, to insure true alignment when starting.

The keyway in the mating shaft can be milled out wider, to suit the new keyway in the bore, or a two-step key can be machined.

This method has since proved itself many times on large, awkward-to-handle parts when conventional methods are impractical or equipment is not available. *Frank Biechele, Bronx, NY*



Section A-A

Impression Compound Checks Molding Die Cavities

When building plastic and aluminum molding dies which have narrow, deep cavities, it is sometimes hard to see whether all the tool marks have been polished out of the work. If some such marks happen to be left on the die, the first sign of them is on the finished parts, which can cause trouble because the die is then hardened and difficult to change.

We have successfully tried the use of dentists' impression compound (the material that is used to make a model for dental plates and bridges), to find whether our dies are ready for hardening. This compound will become soft and pliable at about 132 F, when it can be quickly pressed into the die cavity by hand, and will harden in about 30 seconds. Blowing compressed air into the cavity removes the model, which can then be examined for undercuts and tool marks. This sample can also be measured, for it becomes quite hard when cold.

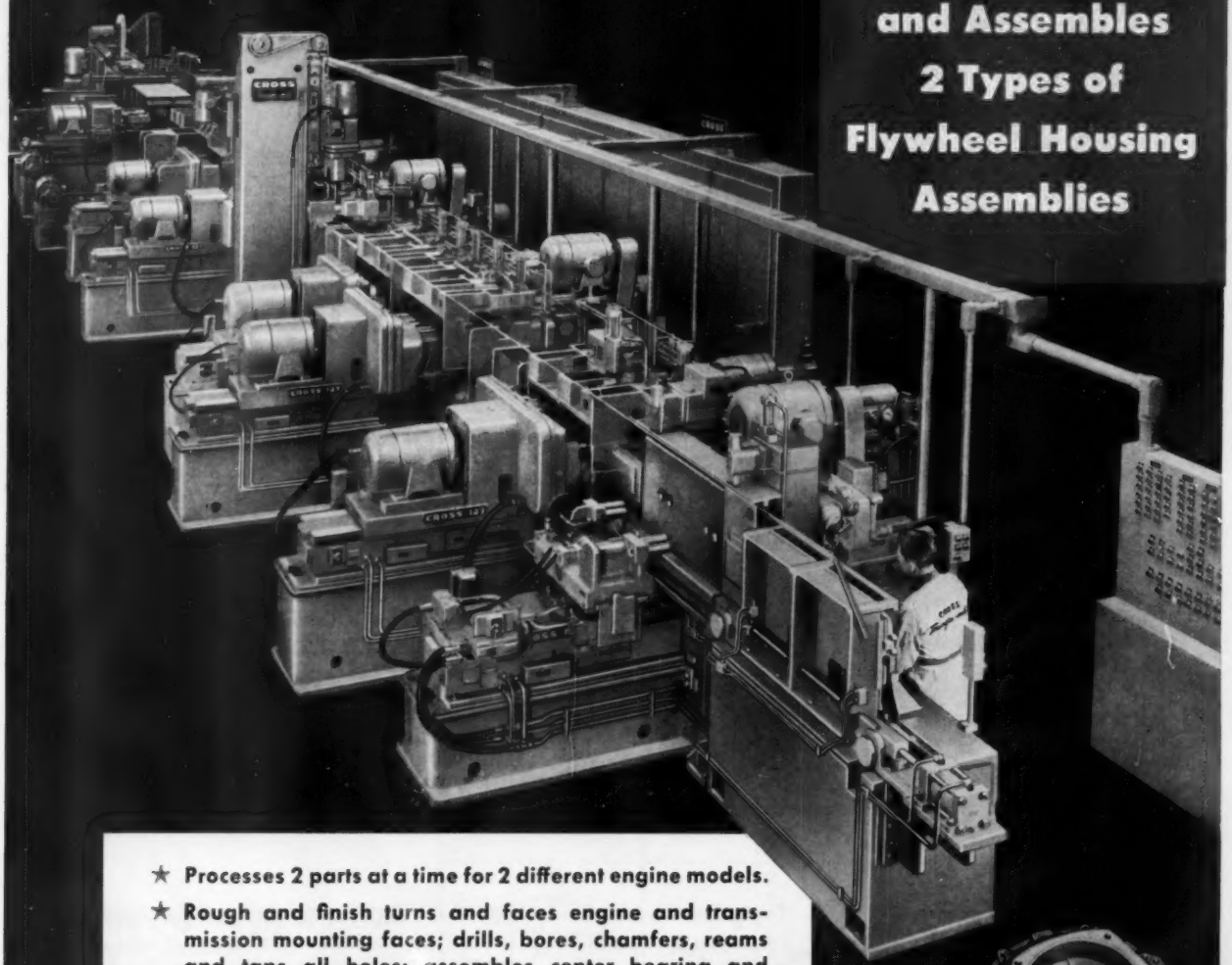
When the cavity is fairly large, the die should be slightly heated for best results. The compound can be reheated and used over and over again. *Fred H Dingenfelder, Milwaukee, Wis*

Drills for Plastics

Special - purpose carbide - tipped drills are best for drilling thermosetting plastics. But if you don't have these tools on hand, improvise by making a triangular reamer from a triangular file. This tool will drill an excellent hole with very little chance of scrap. *F Strasser, Santiago, Chile*

Another Transfer-matic by Cross

Bores, Faces, Drills and Assembles 2 Types of Flywheel Housing Assemblies



★ Processes 2 parts at a time for 2 different engine models.

★ Rough and finish turns and faces engine and transmission mounting faces; drills, bores, chamfers, reams and taps all holes; assembles center bearing and 2 dowels; finish bores and inspects center bearing after assembly; washes, dries parts for final assembly.

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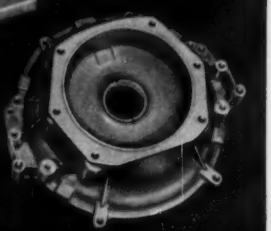

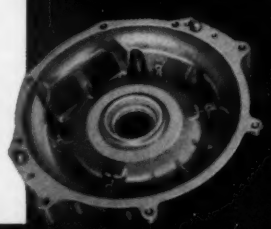

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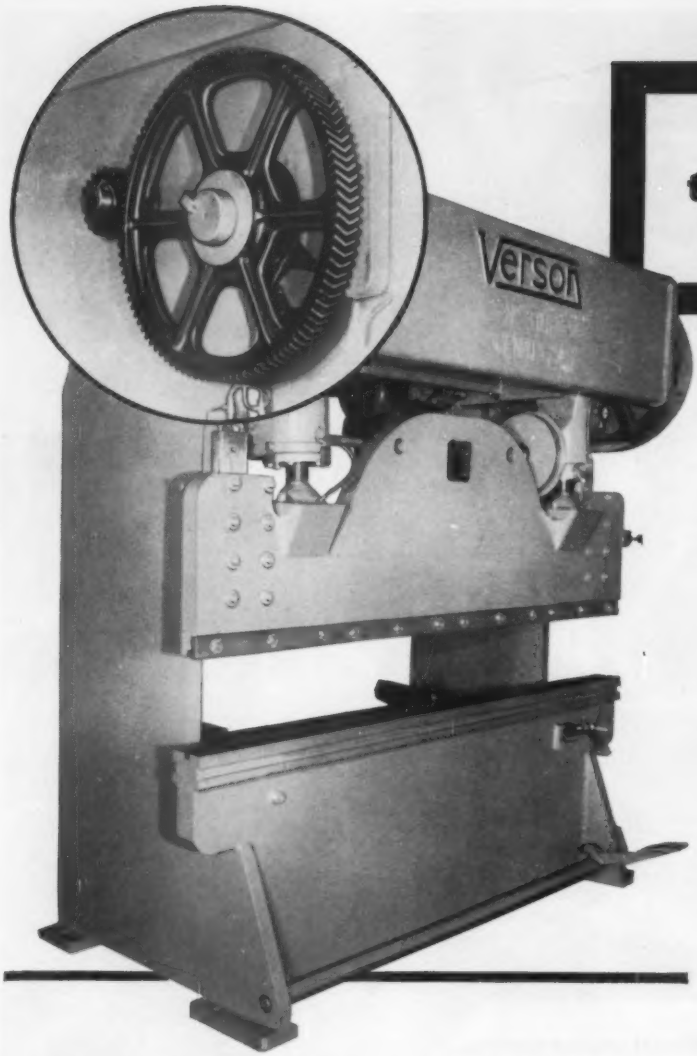

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CHECK LIST FOR JIG AND FIXTURE DESIGN . . I

G R TINDALE, SOUTH AUSTRALIA

Experience has shown that, in the design of jigs and fixtures, it is easy to overlook features which have an important bearing on successful working of the tools.

How often, for example, has it been discovered after a jig has been made, that the workpieces will not fit in it, because the designer has not provided enough clearance to accommodate variations in size of the component castings?

To minimize such unfortunate oversights, this check list has been designed. The chart shows first of all the main functions of the tool, and their related factors, and indicates the group and section number in the following question list, where the particular point is discussed.

These check questions may be asked when reviewing the design.

GROUP NO.	FUNCTION OF JIG OR FIXTURE	RELATED FACTORS AND SECTION NUMBERS				
0	Setting up	0.1 Shop Layout	0.2 Machine	0.3 Cutters	0.4 Setting Aids	0.5 Operator
1	Loading & Location of part.	1.1 Shop Layout	1.2 Nature of part	1.3 Previous Operations	1.4 Cutters	1.5 Operator
2	Clamping & Support of part	2.1 Kind of Operation	2.2 Nature of part	2.3 Machine	2.4 Cutters	2.5 Operator
3	Positioning tool to cutters	3.1 Tool features	3.2 Special equipment	3.3 Machine	3.4 Cutters	3.5 Operator
4	Cutter guiding	4.1 Nature of operation	4.2 Second operation	4.3 Coolant	4.4 Cutters	4.5 Operator
5	Chip Control	5.1 Nature of part	5.2 Tool Features	5.3 Machine	5.4 Cutters	5.5 Operator
6	Measurement of part	6.1 Cleaning	6.2 Clearance	6.3 Nature of Measurements	6.4 Datum Faces	6.5 Operator
7	Safe working	7.1 Part	7.2 Tool	7.3 Machine	7.4 Cutters	7.5 Operator
8	Handling and storage	8.1 Lifting aids	8.2 Loose parts	8.3 Fragile parts	8.4 Identification	8.5 Storage aids
9	Manuf. and Maint.	9.1 Cost	9.2 Standards	9.3 Manufacturing Facilities	9.4 Design features	9.5 Prov. for Maint.

0. Setting up the Jig or Fixture

0.1 Shop Layout

Is there any obstruction in the shop layout which will affect setting up the fixture, e g, columns in the way?

Are the necessary services, such as air lines, available?

If a hoist is required, is it available, and can it be maneuvered into place?

0.2 Machine

Are the correct speeds and feeds available on the machine?

Is the machine accurate enough for the operation?

Is the machine sturdy enough for the operation?

Will the fixture fit into the machine for which it is intended?

Has the machine sufficient head room and stroke of slide, or quill, to perform the operation when the jig and cutting tools are in place?

Is there sufficient throat depth, between spindle and column of machine, to accommodate the jig?

Is the weight of the fixture too great for the machine?

Do the T-slots in the table line up with the clamping holes or slots in the fixture?

Is there enough clearance in these holes or slots to permit adjustment of the jig under the machine spindle?

Will the fixture overhang the end of the table when in place?

Are the register blocks in the fixture base the correct size for the machine, and are they correctly located?

Is there any projection, boss, bolt head or other machine part which will foul the jig or fixture?

Will any operating handle of the machine strike on the fixture, or be prevented from moving by the fixture?

Will the jig interfere with any other jig or fixture next to it on a multi-spindle machine?

Are jig-hole spacings within the range of adjustment of the spindles when a multi-spindle head is used?

0.3 Cutters

Can the setup man see whether the cutter or drill is correctly set?

Can cutting tools be adjusted when the fixture is in place?

Can cutters be readily removed for sharpening without disturbing the fixture?

0.4 Setting Aids

Can setting blocks, bushings, stops or collars be used in setting up the cutting tools?

If dial indicators are required for the setup, are there suitable places for mounting them on the cutters or fixture?

Have suitable locating plugs been provided for setting up?

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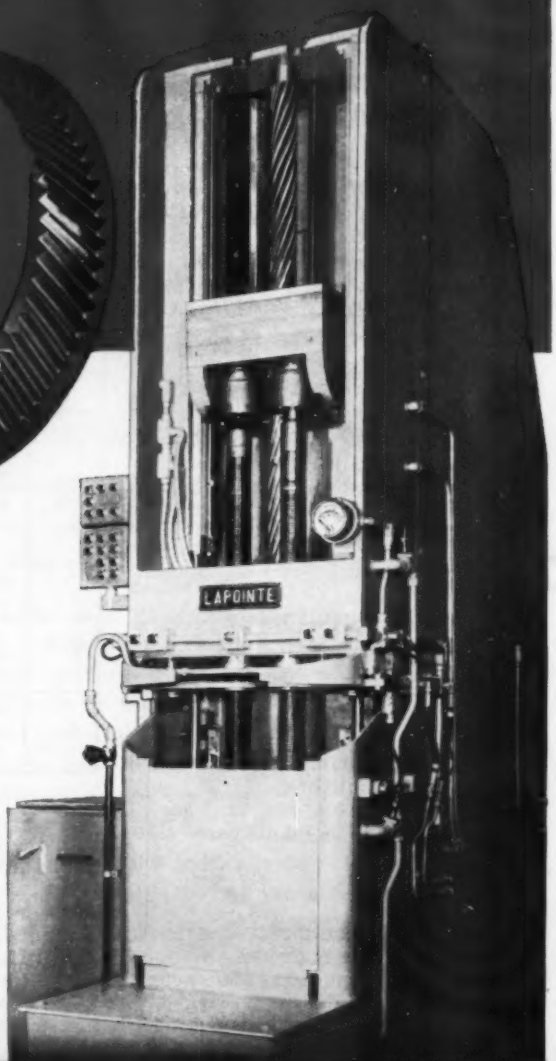


Built for high production, and using two identical broaches rotated in true synchronism by a sturdy lead bar, this new LAPOINTE machine broaches **helical internal gear automotive parts** two at a time, at a rate of 320 parts per hour . . . at 80% efficiency!

No wonder that it **broaches without chatter:** it has massive, quiet gears . . . a heavy, rigid frame . . . and electro-motive drive! No wonder, either, that because of these features the work is more accurate, and tool life is increased 400% to 500% between grinds!

[redacted]

for broaching speeds of 10 to 100 feet-per-minute.

Can be built in other types and sizes up to 50 tons.

Send today for literature. Ask for Bulletin **VUE-7-2.**

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

CHECK LIST FOR JIG AND FIXTURE DESIGN . . II

Is the accuracy of the part such that inbuilt adjustments are required in the fixture, to compensate for machine misalignment?

Will an accurate sample part be useful as a setting master?

0.5 Operator

Does the setup man need more than one size of wrench? If so, can the number of sizes be reduced?

Are the hold-down bolts awkwardly placed, making their insertion or tightening difficult?

Is the setup man required to handle excessively heavy or awkward equipment?

1. Loading and Location of Part

1.1 Shop Layout

Is there any obstruction in the shop layout which will hinder the loading of the part into the fixture?

Is the jig design correctly related to the "flow line" of the process?

Is the fixture to be used in conjunction with material handling aids, such as hoists, hoppers, or conveyors?

If so, is the design correctly related to such equipment?

1.2 The Nature of the Part

How will allowable variations in the shape of the part affect its location in the jig or fixture?

Is there enough clearance in the jig to allow for all lumps, fins, lugs, burrs or protrusions on the part, and for all normal variations in size and shape?

Please check this point again, as castings and forgings often vary from the drawings.

Will a profile plate on the jig base, or sighting holes in the jig plate be useful in locating parts which are not consistent in shape or size?

If no previous operations have been done on the part, are there suitable datum faces or points from which to locate?

Can such points be properly related to the results required from this operation?

If the shape of the part makes location difficult, is it possible to have it modified to assist in locating it?

If the completed shape cannot be changed, can some temporary lug, or other helpful feature be provided, which can be machined off when its purpose has been fulfilled?

If the component is heavy, can arrangements be made to slide it, rather than lift it into place?

Where only one end of a long component has to be loaded into a fixture, has a suitable support or outrigger been provided to carry the free end?

Have V locators been placed in the correct plane so that variations in the locating diameters will not affect the accuracy of this operation?

Are the locating points as widely spaced as possible?

Are the locators affected by the material from which the part is made?

Is the component material so abrasive as to warrant the use of carbide locators?

Are the locating points those from which the result of this operation is dimensioned on the part drawing?

If the part is a rough casting, can a 3-point location scheme be used?

If not, can a suitable jack pin or adjustable locator be used to provide the fourth point?

Should any other locators be adjustable to allow for casting variations?

Are centralizing devices required to take care of part variations?

Are all locators on the same side of the parting line of a casting, or of the flash of a forging?

If not, what effect on the location will mismatching have?

Is it possible to have all the locators on the bush plate of a drill jig, thus insuring correct relationship between locators and holes?

Where several parts are located in the tool, should each one have its own locators, or will the accumulation of errors, caused by parts resting on one another, be acceptable?

1.3 Previous Operations

Do previous operations provide suitable datum and location points?

Is the tolerance on the locating points sufficiently close to obtain the accuracy required from this operation?

Can all subsequent operations be located from the same points?

If so, can the locators in all these fixtures be made identical in size and shape?

Have locators been relieved to accommodate burr thrown up by previous operations?

Have locating surfaces on the jig been kept as small in area as practicable?

Where they locate on a machined surface, do the rest pads come well within the boundaries of the machined area?

Are they well above chip-collecting surfaces?

Are they easy to keep clean?

Does the required accuracy demand expanding pins, when locating from previously machined holes?

In boring fixtures where more than one hole is to be finish bored, after rough or intermediate boring: has the part been located from the smallest bore in order to minimize deflection of the slender boring bar with an eccentric cut?

Where location is from accurately machined or fine finished surfaces, have steps been taken to avoid scratching or distortion of part by locators?

1.4 Cutters

Are locators safe from damage by cutters over-running or being set too deep?

Do any cutters, such as long drills, interfere with loading or location of part? This sometimes happens when drilling on different levels with a multi-spindle head.

1.5 Operator

Can the jig be made easier to load and unload?

Is there plenty of room for the operator's hands when loading and locating the part?

Are the clamps well out of the way when loading and unloading?

Are the locating points easily visible to the operator?

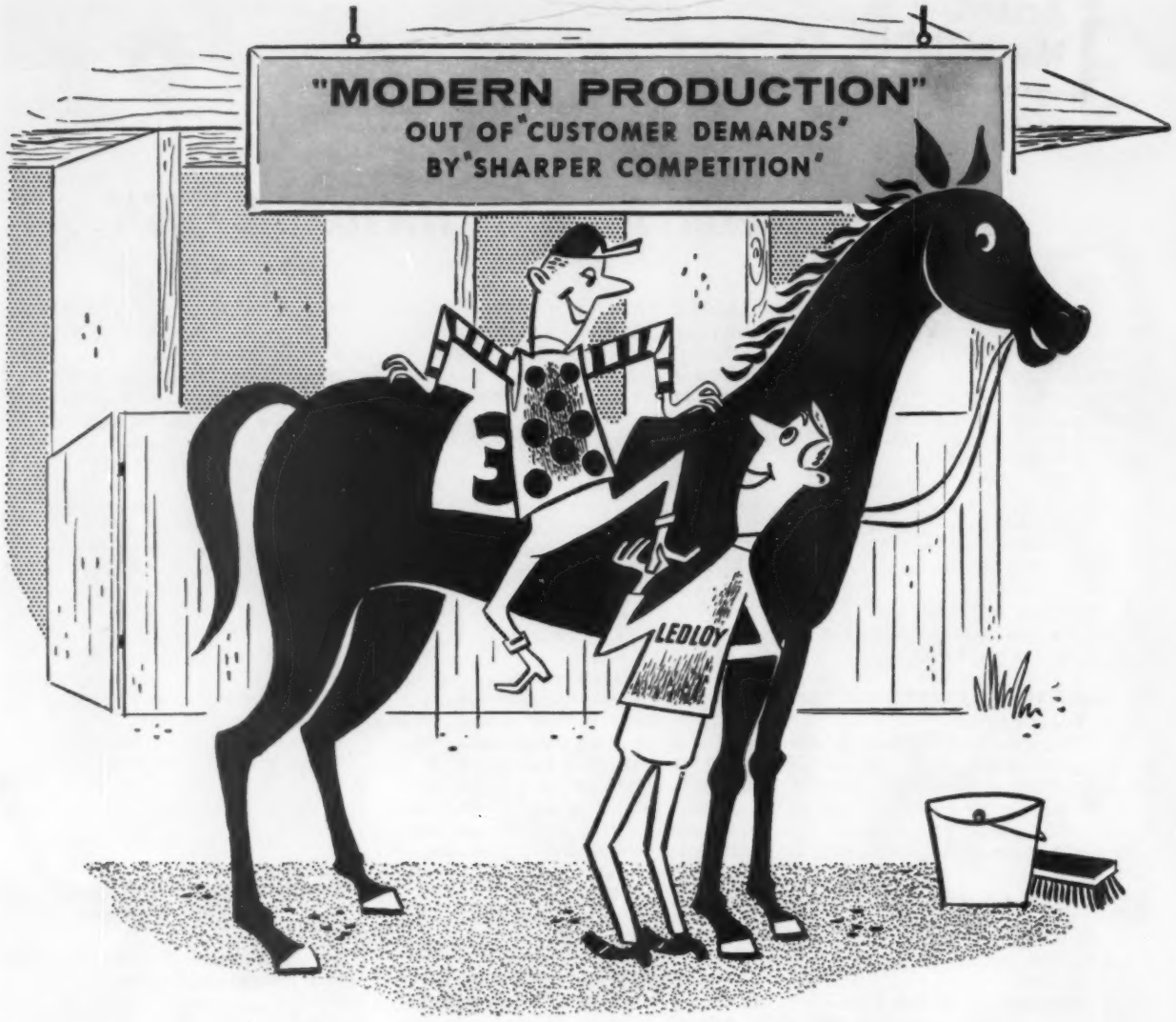
Have locating pins been reduced to their shortest practicable length and smallest permissible diameter?

Have they been provided with effective "bullet noses"?

Where two locating pins are used, has one been relieved to a "diamond" shape, and is one shorter than the other to make loading easier?

Is there enough clearance for the part to be easily lifted over, or into, locating and centering devices?

If the component is heavy, and is to be located from previously drilled holes, is it possible to provide disappearing location pins which can be raised when the part has been slid



Want a "Leg Up" On Production?

If you're "left at the post" in today's race for quality production at competitive prices, better study Ledloy's* form sheet.

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- Longer tool life
- Fewer production line breakdowns
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ARISTOLOY STEELS

Truly a steel with "Built-in Productivity."
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CHECK LIST FOR JIG AND FIXTURE DESIGN.. III

into its approximate located position?

Can one end of a heavy component be rested in its approximate position while the operator loads and locates the opposite end?

Have sliding pins, and other hand-operated locators, been provided with comfortable handles, allowing a good grip?

Did you know that knurled knobs or screws, used continuously, will make the operator's fingers very sore?

Can all movable locators or jack pins be operated with one handle or one movement by the operator?

Can locators or jack pins be locked by the act of clamping the part in the jig?

Are all movable locators and adjustments on the side of the fixture nearest to the operator?

Should duplicate holding devices be provided, so that one may be loaded during the machine cycle?

If the fixture is designed for multiple parts, can they be pre-positioned during the machine cycle, in some form of magazine or loading rack?

Is it possible to load the jig with one hand while the other hand is discarding the completed part?

Is there a fouling device to prevent the part being loaded incorrectly?

Do the burrs, thrown up by this operation, interfere with unloading?

Is it desirable to provide an ejector?

If so, can it be operated automatically when the work is unclamped?

Can the finished part be ejected by loading the new part?

2. Clamping and Supporting the Part

2.1 The Kind of Operation

Is the cutting force heavy or light in this operation?

If it is light, is it possible to avoid clamping the component in the fixture?

If heavy, is the part rigidly supported and clamped in a manner best suited to resist the cutting forces?

Is the part supported as close as possible to the point where the load is applied?

Is the cutting force resisted by a solid support, rather than by the clamp?

Will the cutting load distort or bend the component or the jig because of inadequate support?

Will the operation tend to tip or tilt the part in the jig?

Will it upset or twist the jig on the machine table?

Can the cutting force be used to help locate and secure the part in the jig?

Is the clamp strong enough to provide the necessary holding force?

If the fixture rotates, will centrifugal force tend to loosen the clamp?

2.2. The Nature of the Part

Will the clamping force, bend, crush or bruise the work?

Should a torque-limiting screw, or similar safety device, be built into the clamp in order to prevent overstraining frail components?

Should brass, leather or fiber faces be used on the clamps to avoid spoiling the surface finish of the work?

Has the clamp enough range to take care of allowable variations in the workpiece?

Where more than one part is to be clamped, have suitable equalizing devices been included in the clamp to cover their variations in size?

If there be more than one clamping point on the part, are they as widely spaced as practicable?

Is the work supported directly under the clamping points?

Will the clamping force distort the part enough to allow the surface, machined in this operation, to spring out of true when the clamp is released?

Will the clamping force bend the jig plate, or other part of the tool, and cause inaccurate work?

2.3 Machine

Can the movement of the machine table or quill be used to operate the clamp?

If an air-operated clamp is used, can the control valve be worked by the engagement of the machine feed lever?

Can a hydraulic clamping device be built into the circuit of the machine?

Does the clamping mechanism place any undue strain on the machine?

Will the clamp, whether open or closed, foul on any part of the machine?

When the clamp is thrown or dropped open, can it do any damage to the machine?

2.4 Cutters

Will the cutter be struck by the clamp when it is being opened or closed?

Will the cutter strike the supporting surfaces when it passes through the work?

Will cutter vibration or chatter tend to loosen the clamp?

2.5 Operator

Can the clamping be done easily and quickly?

Can all clamping devices be operated from the side of the fixture nearest to the operator?

Does the operator need a special wrench to clamp the work, or does he need more than one?

If so, is it possible to arrange for one standard wrench to tighten all the clamps?

Better still, can all clamps be self contained, thus avoiding loose wrenches?

Can C washers or clamp plates be made captive by hinges or pins, in order to do away with loose parts?

Can all clamping arrangements be combined so as to operate with the movement of one handle?

Would the clamp be easier to lift or move if a handle is attached?

Does the operator need a fixed handle, or similar grip, in order to hold the jig firmly while operating the clamp with his other hand?

Does clamping require much exertion by the operator?

Does the size of the work, or the required clamping force, warrant the use of compressed air or hydraulically operated clamps?

Can the clamping be speeded up by means of compressed air, cam operated, or quick-action toggle clamps?

Is it possible to clamp the jig with one hand, while the other is engaging the feed lever?

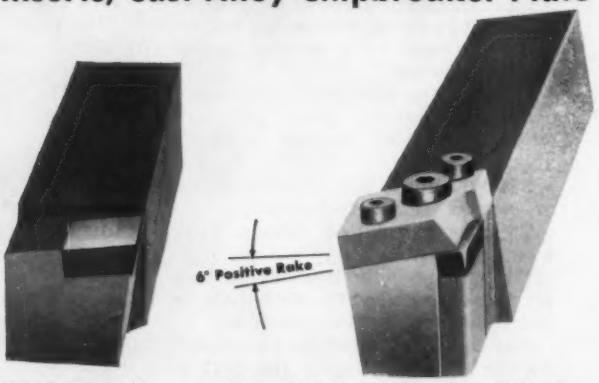
Has provision been made to prevent clamps twisting or turning when tightened?

Have clamps been provided with springs or other means of lifting them clear of the part when loosened?

(To be continued)

Here it is!
The NEW V-R TOOLHOLDER with 6° positive rake

Works Like Positive Rake Brazed Tool . . . Saves Money with "Throw-Away" Inserts, Cast Alloy Chipbreaker Plate



AR brazed tool

New V-R 6° Positive Rake Toolholder

Both will do exactly the same operations!

SAVES MONEY 8 BIG WAYS

- Free cutting action of 6° positive rake ends excessive heat . . . eliminates distortion of piece parts.
- Allows use of harder grades of carbide than are normally used in brazed tools.
- Elimination of excessive heat with positive rake toolholders allows machining to closer tolerances.
- Patented V-R "elevator" locks "Throw-Away" insert solidly in toolholder at 6° positive rake angle . . . firm as a brazed tool.
- Cutting edge automatically positions on center . . . saves setup time.
- In case of tool "wreck", elevator is quickly and easily repaired or replaced.
- Insert indexed to new cutting position in seconds.
- Eliminates all carbide grinding.

Now V-R combines the operating efficiency of a positive rake brazed tool into a 6° positive rake toolholder with the proven economy of "Throw-Away" blanks and a cast alloy chipbreaker.

NOW A TOOLHOLDER FOR MACHINING METALS REQUIRING POSITIVE RAKE

Aluminum, soft brass, copper, bronze, stainless steel and all other types of materials, including alloyed steels can now be machined more easily and economically than ever before.

All the advantages of positive rake design can mean savings in your plant with this new V-R Toolholder. Call your V-R representative or write today for complete information.

See new V-R positive rake toolholder, Production Engineering Show Chicago, September 6-16, Booths 246-247.

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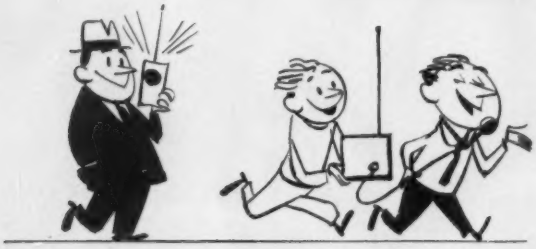
Talking Shop . . .



Walkie Talkie

AT A RECENT OPEN HOUSE in the new Metals & Ceramics Lab of GE, speakers used a portable loudspeaker setup on a 2-wheeled truck. An assistant pushed the truck, carrying a battery, amplifier, speaker and controls, while the guide—or speaker—wore a throat mike connected to the truck by cable. All visitors in the group could hear, and there were neither hoarse throats nor confusion despite shop noises. Here's an idea worth broader application.

Sawsmith

ARISTOCRAT of shop mechanics is the sawsmith, according to R Hoe & Co, Inc, NYC, oldest sawmakers in the US. He used to wear silk topper and frock coat, but even today he gets over $3 an hour. There are only about 150 sawsmiths in the US, five at Hoe. They are the boys who hammer saws—just right—to put the "life" or "tension" in. It's a highly skilled job demanding good hearing and a good sense of touch. It's also a family trade—the tricks being passed from father to son.

Engineers' Incomes

NATIONAL Society of Professional Engineers has made a second salary survey of 14,328 members, of which 4892 are in the Northeast, 5258 in the Midwest. Greatest percentage (54%) entered the profession from 1920-1939. Some 5309 work for private industry, 1632 are in private practice, 2785 work for government, 1585 for public utilities; others are in construction, education, and the like. Only 10% earned over $18,210, only 25% over $11,700, but 90% earned over $5,570. For ME's specifically, the figures correspond closely with these averages. Chemical engineers are higher. Top incomes went to men in executive work, next highest in sales, and the others in order are research and development, design, production, teaching, construction, supervision. Employees in industry had the highest median incomes, those in public utilities second (no figures are given for the privately employed). Medians by region were: Northeast ($9310), North Central ($8200), Southeast ($8170), Far West ($7900), Southwest ($7710), North West ($7630).

Real Scalper

AN UNUSUAL milling machine has been developed in Italy by Innocenti Co for scalping steel ingots. Work goes through the machine at over 1800F, and cutting speed is 1644 fpm. As a result, there is so little heat loss that ingots can pass directly to the rolling mill without additional heating. All four faces of a 6600-lb ingot are machined in 6 min. The drum-type cutter has a diam of 84 in.

Safe Lock

MASTER LOCK Co, Milwaukee has a safety record seven times better than the hardware industry's average, according to Employers Mutual Liability Insurance Co. Master made last year a low of 1.3 disabling accidents per million manhr worked, half what it was in 1950. National '54 average on hardware plants is 9.4, for all industry 11.5. The company employs about 500. Responsibility for safety is vested in the personnel manager and foreman. Regular safety meetings are held, and the plant reportedly has excellent housekeeping, lighting and safety devices, with unusual use of color on machines.

Yes—and No

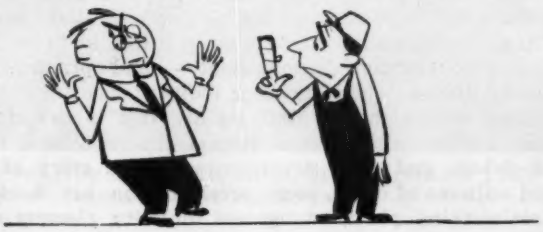
JOSEPH R NEILL, president of Watertown (Conn) Mfg Co, former state senator, is chairman of the Conn Development Commission, a state agency to help bring new industry to the Nutmeg State. But Mr Neill is moving one division of his own plastics-mfg company (100 of his 400 employees are involved) to the Midwest. He blames riding along on the reputation for Yankee ingenuity and an unfriendly attitude of the community toward industry (in terms of taxes, zoning, poor water supply and inadequate police protection). But his customers are in the Midwest, so that hard economic facts may be a large influence.

Nicknames

GOING ON with our parade of nicknames for metal parts, we beg to report that Chevrolet-Atlanta calls the generator pulley a flowerpot. The Pontiac rear-bumper retainer is a grass blade. The center pillar moulding for Olds is a tulip moulding, a wheel-nut runner is a gatling gun, the heater blower cover is a frying pan, and a defroster duct an elk horn. The front-fender stone shield is a pork chop, the radiator frame a horse collar, bumper brackets are false teeth, and upper and lower wheel-control arms are called buzzard wings. There are dozens of others peculiar to this plant. Maybe Georgia generates 'em!

Longer Die Life

HARD-FACED hot-forge dies last three times as long as unprotected dies for Warren Tool Corp, Warren, Ohio. Dies are used to forge, trim, and punch cutter-mattock heads. Hammer dies show no wear after 6000 pieces, trimmer dies the same (formerly 2500), punch dies 6000-8000 (formerly 900). Facing material is Hastelloy C, which gives a 210 Bhn surface, yet machinable, that workhardens to 325-375 Bhn without noticeable deformation.



FREIGHT CARLOAD OF LIME bubbles and boils as it floats down the raging Naugatuck at Ansonia, smashing everything in its path. Floating heavy equipment was a major cause of damage

HELL AND HIGH WATER on the

"Go find the worst-hit plants in the worst-hit flood areas" were the boss's orders. Most news stories to date have been general; this one is specific. The damage from the floods was so extensive, we *couldn't* cover every plant. Here's the story of Metalworking in the Naugatuck Valley, as seen by two *AM* editors who went in with camera and notebook on Flood Day plus 3, didn't come out until Flood Day plus 7 . . .

WILLIAM M STOCKER, JR, and ROBERT N SHEETS
Associate Editors

NAUGATUCK VALLEY, CONN — This is a story of men, machines and a river that went mad. It's a story of 50-mile-an-hour waters careening down a river normally not much bigger than a trout stream. It's a story of death, disease, and destruction, of rushing waters that carried off homes, buried whole towns in silt and debris, and destroyed or damaged millions of dollars worth of metalworking plant and equipment—something to think about when you realize that flood insurance (or "rising water" insurance as they call it up here), is so fabulously priced as to be almost nonexistent — and practically no home or industry has it.

But mainly this is the story of men against the river and its destructiveness. It's a story of company presidents in hip boots and dungarees directing cleanup operations in knee-dup mud. Of desk men wielding shovels and brooms. Of the president's wife and the laborer's wife side by side handing out sandwiches and coffee they made in their own kitchens. Of girls in blue jeans working in offices that a few hours before were waist high in water. Of plant nurses operating first-aid stations out of the backs of their own cars.

It's a story of sheer, backbreaking bull labor, of long wet hours in a stinking mess that was once the place you worked in. You do it, and you do it willingly if you're one of the men of the Naugatuck Valley, because it's something that's got to be done. It means your very livelihood. No matter how high the waters of the raging Naugatuck have risen, the men of the valley have risen above them in the fight to bring life back to normal here.

You know the story of the floods that hit here in August. They hit a lot of other places too, like Stroudsburg, Pa, and up at Putnam, Conn, where the magnesium plant blew up. The papers have been full of it.

FARREL-BIRMINGHAM, ANSONIA, LOOKED LIKE THIS when the flood crested 15 ft above its ground floor, inundating the roll shop, and rising almost to the ways of machine tools on second level

Naugatuck... an On-the-Spot Survey

The rain fell here and up in the Berkshire mountains, just over the Massachusetts line. Twelve inches and more. That's 871,700 tons of water to the square mile!

The ground was already sopping wet from Hurricane Connie the week before. The water piled up. It started down the valley, hitting for the low spots. Rivulets became streams, streams became raging torrents sweeping debris into tributary rivers. These tributaries in turn overflowed their banks, swept trees, bushes, animals — anything in their way — into bigger rivers. The Naugatuck was one. So was the normally tiny Mad River, the "Mad, Mad River" as someone has called it since. These rivers did their worst. And it's a worst unprecedented in the history of American industrial disaster.

What of the men who rose to meet the challenge of getting the Naugatuck Valley back on its feet again? Listen to Leo McHugh. He's a big, handsome Irish kid — a machinist at Waterbury Farrel Foundry & Machine Co. Along with

AFTER WATER RECEDED, ROLL SHOP LOOKED LIKE THIS at Farrel-Birmingham. Churning water and debris caused damage that will take many weeks to repair

DISASTER... USA

At Winsted, time ran out on Gilbert Clock . . .

FOUR-STORY BRIDGE SPANNED THE DAM AT GILBERT to join these buildings. It's gone now, and with it all of the records of this 148-year-old company. And no duplicates! Main offices (right) will be rebuilt. The built-in-1870 manufacturing buildings (left) suffered relatively little damage, but press room, plating room and finished parts storage were under a foot-to-18-inches of silt and debris

THE FLOOD HIT THE NIGHT OF THE 18TH destroying lives, homes and jobs. This store is on mile-long Main St, Winsted, when two rivers fused to turn the street into a torrent of death and destruction

maybe 30 other men on the night shift, he was trapped in the plant early on the morning Friday, August 18, the day all hell broke loose on the Naugatuck.

"I was up on the second floor of the plant. Water up to my knees. The whole shipping yard outside was under 15 feet or so of water already and it was raining pitchforks. I was looking out the window and I heard somebody yell 'I can't swim.' I couldn't see much on account of the rain. Then I saw him. It was a man hanging on to a post out there in the yard. I jumped in. The water was only a foot or so from the window-sill.

"There were a lot of logs floating around. Nearly squashed me. I grabbed a couple and shoved them together into a kind of raft and paddled it over so the guy — I knew him, he was one of our electricians — could grab hold. I pushed him over to high ground. He could walk from there OK, so I left him and went back to the plant.

"What do you mean it's funny I didn't climb out to high ground too while I had the chance? I work here, don't I? There was plenty still to do moving stuff in the plant so the water wouldn't get at it."

Leo swam back into a plant he didn't know for sure wouldn't be swept right into the river in the next hour or two. He spent 28 soaking-wet hours in there before he was pulled off along with the others in Civil Defense boats. During those hours they saved all the plant's irreplaceable records. And they moved thousands of dollars worth of delicate machinery, motors and instruments out of the way of the rising waters.

"A Job to Do"

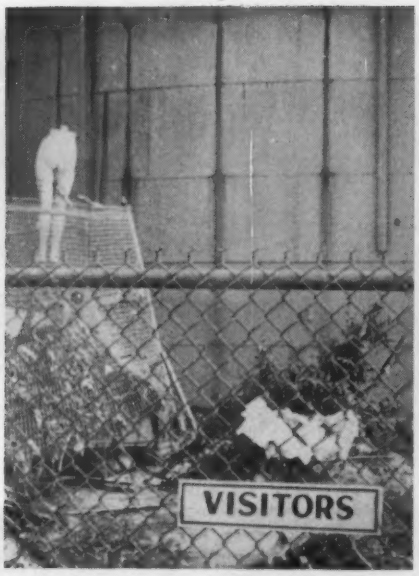
To Leo it was just "a job to do." Whatever you want to call it, it's the rule, not the exception in this valley, where there's no crying over spilt water. Everybody's too busy.

Workers, even flooded-out ones, started trickling back to the plants to "see if I can help" even before the waters started to ebb. From Winsted on the north to Derby on the south, every able-bodied man has been working like a horse for longer hours than he cares to think about. Even the old fellows nearing retirement age want to get in there with a shovel but "you can't let a man like that, who's been on a bench maybe 25-30 years, do heavy manual labor — especially when he's shot full of typhoid serum."

Up here at the north end of the Naugatuck, in the foothills of the Berkshires where the Mad River joins, it is the small (population 9000) town of Winsted, Conn. It has a few industries. One of them is Gilbert Clock Co ("in business since 1807"). Gilbert is right on the Naugatuck, a couple of miles above Winsted. Its manufacturing buildings, new in 1871, are multi-storied. Built right up the side of the valley. They're on the left side going down the river. On the right are the offices. Between the two is a narrow dam with a road across it and one or two small offices right on the dam. The dam isn't there now. Nor is most of the office building. The Naugatuck undermined the supports of the building, split it almost in two and carried walls, floors, equipment and records down the river.

A man in dungarees standing on what was left of the dam three days after the flood pointed to a ripped-out corner of the building, "See there? That used to be my office. It's somewhere down the river now. All those records, too. We haven't got any duplicates."

We got across what was left of the dam to the other side where the manufacturing floors are. The lower floor walls were pretty well smashed. We had to go through the back way. The front was piled with debris. Inside, the press room had maybe a foot to 18 in. of silt on the floor and on the bases of the machines. Same with the plating room.



At Torrington, the river brought visitors . . .

AT TORRINGTON MANUFACTURING CO, the river piled unwelcome gifts of household goods, new shoes, garbage; festooned fences and structures with debris. A car dented the top of the gasometer in background!

EMERGENCY CHOW LINE SET UP BY WIVES AND FRIENDS of Torrington Manufacturing employees is headed by Mrs Andrew Gagarin, wife of the president. The food was prepared at home by the people of St Michael's Parish in nearby, undamaged Litchfield. Fresh water for washing was supplied from an apple-orchard-spraying truck loaned by a local farmer. To prevent disease, employees washed every two hours in an antiseptic solution

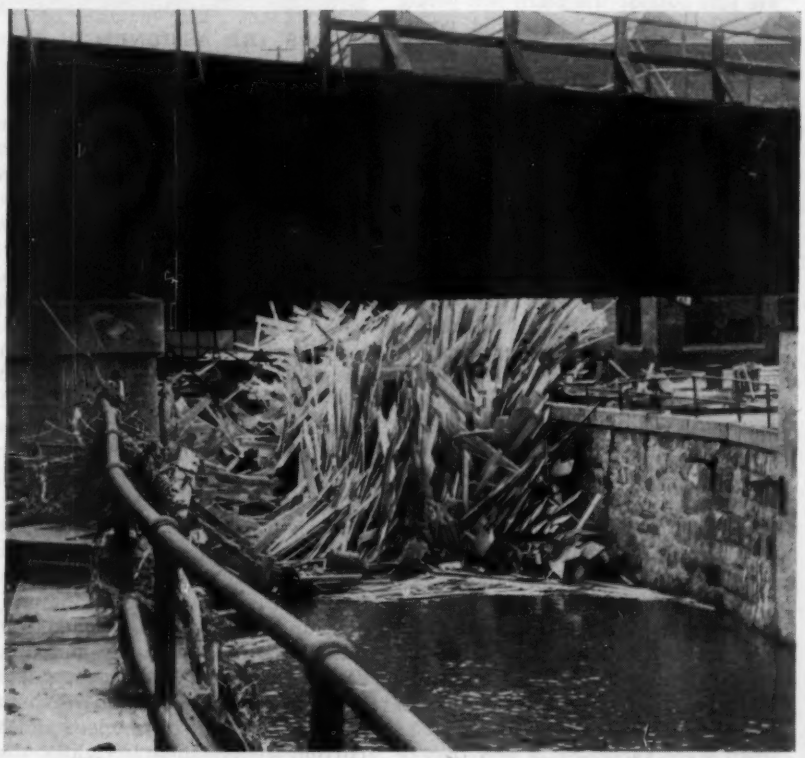
All the doors were blocked. This was a real mess yesterday. The men have been in to clean it up since then.

Upper floors weren't touched, so Gilbert expects to be producing on a limited basis in less than 10 days.

Downriver from Gilbert is the town of Winsted. Or maybe it's better to say what was the town of Winsted. Like all the towns of the Naugatuck Valley, homes and industries on the hills and on the upper slopes of the valley weren't hit. But Winsted's main street was almost level with the confluence of the Naugatuck and the appropriately named Mad River.

It's not a main street any more. It's not even a street. From the undamaged Catholic church on top of the hill you can look down on maybe a solid mile of rubble. Places where there isn't rubble are holes as much as 15 feet deep. So deep you can walk under the main sewer pipes. All along the streets, every 50 feet or so, are armed National Guardsmen. They're enforcing martial law. This town has a 6 pm curfew. You can't get in and you can't get out after that time.

Torrington is one of the biggest industrial towns in the Naugatuck valley, calls itself the "Brass City." Like all the other river towns, the plants up the hill away from the

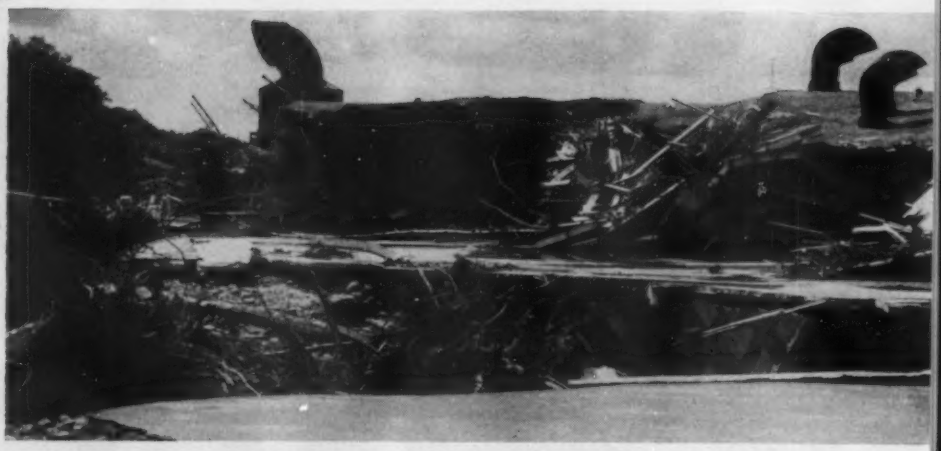


FLOOD-CREATED DAM is typical of a flood-area-wide problem that increased damage. When a large lumberyard upriver from American Brass Co's Torrington plant washed out, several thousand pieces of lumber jammed up at a bridge just beyond the plant, blocking the rushing waters and causing a backup around the plant that increased the water depth by several feet. In other cases downriver, jams were caused by freight cars, tank trucks, washed-out bridges, and even a gasometer

DISASTER... USA

river weren't damaged at all, or very little. But down in the center of town along the river, all hell broke loose. Automobiles, trucks, even railroad freight cars, were piled into plants and buildings. A shoe store washed out, and you could pick up hundreds of pairs of shoes for miles down the river — if you could match them up.

Right in the middle of it all, in the lower part of Torrington where most of the river silt, mud and debris piled against whatever was strong enough to hold it, is Torrington Manufacturing Company. Here, on the fourth day after the flood, the cleanup job is getting into high gear. Torrington Mfg has two plants. The older one is multi-storied. It's located on fairly high ground and only the basement flooded. But the Wire Machine Division is in a new one-story building just above normal river level.



THIS $1½-MILLION PLANT WAS DEDICATED IN MARCH 1955. Only a few feet above normal river level, 50-mph waters crested 22 ft above its floor

CREWS ARE ASSIGNED to the backbreaking job of cleaning ceiling-high debris

Presidents in Hip Boots

They don't want you to go in to this plant, and they'd rather not have any pictures taken right now. It's pretty bad. But sitting at a table just outside the plant is a young fellow in work clothes and boots. "Anybody around here in authority we can talk to about flood damage?" "I guess you can talk to me—I'm the President." He's Andrew Gagarin, and like most of the presidents and top executives up and down the valley, you can't tell him from a laborer.

He's been all through his plants time and time again since the flood waters ebbed, and he's got mud all over himself to prove it. "We're pretty well off as far as machinery goes," he says, "the water and muck got into the basement of the old plant. Came up onto the second floor, too, but just a few inches. It didn't get up to the ways of the machine tools."

"When will we get back into production? In a week at the most. You wouldn't have thought so if you'd seen this place three days ago. We can thank our men for that. They've been wonderful. They started coming in to help just as soon as the water went down. Most of them brought shovels and brooms, even wheelbarrows; from home. Most of them were surprised to find they're getting paid to clean up the mess. Said they didn't expect it—thought it was just a job that had to get done. "Our suppliers and the machine-tool people have been wonderful. Why, one steel supplier has already been here with his own fleet of lift trucks. He picked up all the steel stock damaged by the water. He's re-running it through his pickling and cleaning facilities free of charge. The electric-motor people and the screw-machine people were in here the first day to see what they could do."

Right down at river level along with Torrington Manufacturing is the Torrington plant of American Brass Co, a firm unlucky enough to have all its eggs in one basket. In this case three plants on the Naugatuck river. "I guess the Waterbury plant got it worse than we did," Plant Manager W C Knoeppel says. He's right. But the Torrington plant got it in the neck, too—mostly because of a freak flood accident.

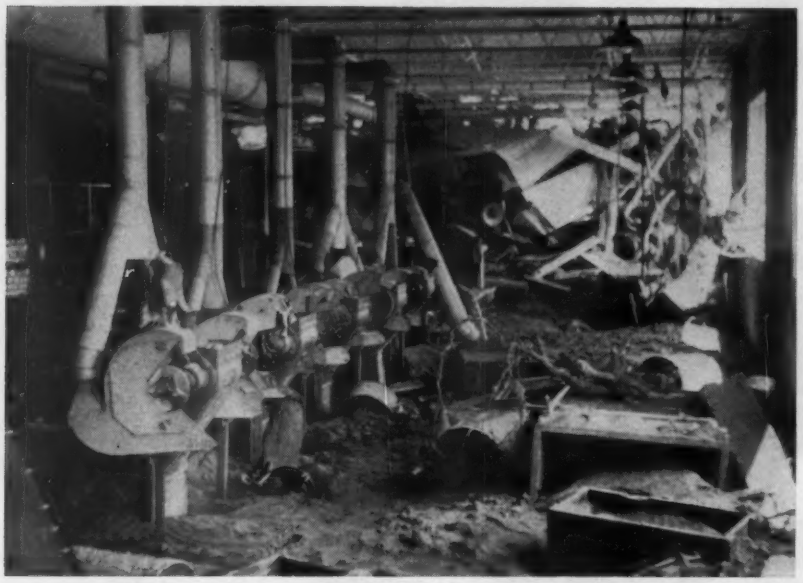
Up the river from Torrington, a big lumber yard was washed completely away. Thousands and thousands of boards of all sizes floated downriver to jam the bridge at American Brass. The speed of the current wedged them in tightly, then smaller debris filled in the gaps. The result was a dam that backed up flood waters into the plant—creating a sort of flood within a flood. These flood-built dams occurred all down the river, it later turned out. Sometimes it was a tank truck, or several big trees, or a washed-out bridge from upriver that provided the keystone for an impromptu dam. But in American Brass's case, it was boards—thousands of them.

At American Brass the clocks all read 3:02. That's the time the power went off on Friday morning. Third shift men in the plant knew the water was rising "but it was raining like hell and we didn't pay much attention until it was too late."

American Brass's machine shop got off lightly compared with most of the lower-floor facilities. Damage is mostly to motors. Some of them are being sent out for drying and rewiring. And three days after the flood there is talk that one major motor manufacturer will set up a drying system right in the plant. And, one of the supervisors said, "we're going to try shorting out the big motors with heavy resistance. That way, the motor dries itself out." In all, throughout its several damaged departments, American Brass figures it has 5000 motors to dry.

The tube and sheet mills and the foundry, all on the ground floors, are hardest hit. American Brass had just installed a new aluminum sheet facility, not even in production when

Plume & Atwood... "in 80 years, the water was never higher than 18 in. below floor level"



PLUME & ATWOOD'S BUFFING SHOP ON FLOOD-DAY PLUS 4 looked like this. From floor to ceiling, the plant was literally packed under pressure with debris and muck (note background). This department fared better than most at P & A. It was protected by a reinforced dividing wall. Preliminary estimates of damage to this plant alone are $100,000 to machine tools, $300,000 to the building, and $700,000 to finished parts

SALVAGING PAYROLL RECORDS is a tedious job at P & A. The cards drying here cover employee names starting with N, O, P, Q. They were found in a steel case 300 ft from the plant, almost the only ones recovered

the flood hit. It had, among other things, two brand-new Lewis rolling mills, valued at $2½-million between them. They're both under six feet of silt and debris. Near them is a brand-new Cincinnati roll grinder. It's covered with silt, too. Workers are carefully digging them out with shovels to avoid damaging the delicate parts. At one end of the floor is a row of bell-type annealing furnaces. The bells themselves weigh several tons, but to a flood anything that's built like a boat floats. The water picked up one of the bells, carried it about 200 feet through the mill, smashing everything that got in its way. It wound up on top of a muffle furnace at the other end of the plant.

Down in the tube mill, the most spectacular flood damage was caused when a muffle furnace that had been operating at 800 C and didn't have time to cool down before the water hit, blew up as the flood hitting it generated steam. In the foundry, they were melting brass in several induction furnaces. The water never got to the furnaces, but it did get to the power supply. Now American Brass has the tough job of getting the solidified melt out of the furnaces. And in the quality-control laboratory, a $40,000 electronic spectrograph—a new type that provides exact alloy content within 5 minutes—was completely under water.

"We haven't the least idea when we'll be back in operation," manager W C Knoeppel said, "but we should have rod and wire in a week or so, as soon as we get power. They're on the upper floors and weren't affected. We may get some other operations going in two or three weeks, and some may take months. We've got the men working in two shifts, from 7 am to 1 pm, and from 1 pm to 7 pm. That's all we can do in daylight, without lights and power."

Safety That Backfired

Ten miles down the river from Torrington, at Thomaston, is the plant of Seth Thomas Clocks. This famous old clockmaking firm, like American Brass, was the victim of a flood-created dam. Seth Thomas had been flooded before, and back in 1938 it built a sluiceway to carry off any waters that rose too high around the plant. Trouble is, this time a milk truck was caught on the bridge alongside the plant. When the water rose, it tipped over and leaned against the bridge, forming a dam that shunted water all around and into Thomas's plant. In this case, it wasn't so much the Naugatuck as Northfield Brook, which joins the Naugatuck at the Thomas plant.

"We figure the damage here is $1-2 million, closer to $2 million," Personnel Manager Wendell F Barr says. "Our finished goods (clocks) storage was completely under water. So was the wooden case assembly and finishing department. Down there, the floors buckled, and the woodworking machines are damaged badly. The crews have been on the job since Friday cleaning up the machines."

Other crews have been at work since then cleaning and re-oiling hundreds of precision stamping dies stored in the basement. They hose off the dies, and put them in a rust-preventive solution. Later, they'll have to be completely disassembled and refinished.

Machines in the basement at Thomas, where they're doing government work, are covered with debris rather than silt (where the waters run fastest and comparatively unhampered, you find debris. Where

DISASTER... USA

This is what happened to Platt Bros, Waterbury . . .

ONLY MACHINERY REMAINS at Platt Brothers' zinc strip plant. The building that once housed this equipment was unreinforced brick and wood columns. A big tank truck washed down the canal behind the plant, lodged against an old, disused water mill, forming a dam. The canal took a shortcut to the river—and took the plant along with it. When the water receded, even a couple of heavy mills had to be retrieved from the river by crane. Most of the machinery, fastened to concrete, held against the full force of the water. Machine shop was destroyed

the waters slow down or back up, it's mostly silt) and crews are taking it in wheelbarrows to a bucket truck in the basement that scoops it up and loads it onto a truck outside the building.

Thomas's men have been back almost 100% since the waters went down. Every night, they're briefed on their jobs for the next day. They were supposed to have been paid off Friday morning, the day the flood hit. They were paid in soaking wet money Monday from a flooded armored car.

Farther on down the Naugatuck, on what is normally almost an island in the middle of the river, is the spanking new plant of an old New England firm, Plume & Atwood Manufacturing Co. The plant was just dedicated last March. It's an ultra-modern, one-story affair. It's still there. It's well built. It had to be —it withstood the full impact of the raging Naugatuck's 50-mile-an-hour waters. The front (upriver) end houses the company's offices. The walls there were torn away by the impact, but the walls behind it stood. The effect is that of an open box with the opening facing the onrushing river.

The view from the upriver end is incredible. From the floor almost to the top of the 15-20-ft ceiling is one mass of debris—jammed in so tightly you can't see into the plant at any point.

Under that mess is ultra-modern equipment for producing brass kerosene lamps, rivets, grommets, washers, lipstick cases, common pins, and stamps and drawn parts.

Let Plant Supt John Bradford tell it:

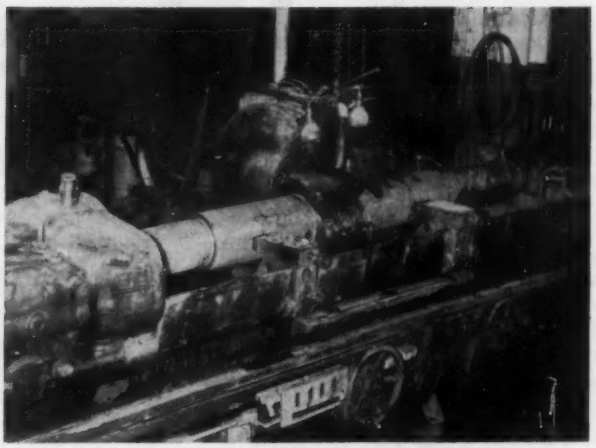
"I was home asleep. The phone rang at about 1:15 Friday morning. It was the night watchman at the plant. 'The water's getting pretty high, you'd better come down,' he said. I drove down and parked my car up on the high ground. The water was coming up fast by the time I got there. I ran into the plant and told the third-shift men—there were only five of them and the watchman—to get their cars out of the parking lot.

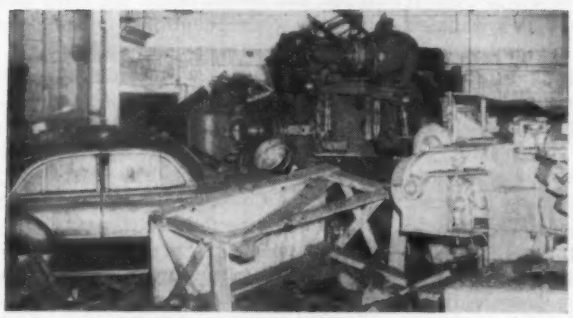
"We tried to get them started, but they were all too wet and wouldn't start. We had to leave them there. They're still there. I guess none of them will ever run again.

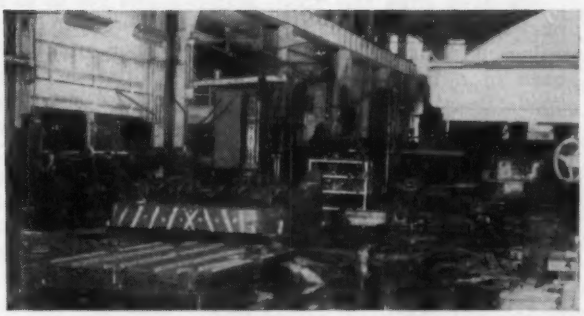
"Then we all ducked back into the building. By then, water was coming in through the office doors. We tried to barricade the doors with desks and anything heavy we could. That held for about half an hour. We decided to let the offices go and try to hold the partition between the office and the plant. We put loaded fork trucks against the doors. They lasted half an hour, too.

"We took the fork trucks then and moved them back down the aisle. We figured out an emergency exit through the men's locker room, where we set up ladders against the

...and to other firms along the Naugatuck







MACHINERY ISN'T "DESTROYED" by water and silt, but every part must be dismantled, cleaned and inspected, and most electrical equipment must be replaced. Here are some "casualties": (top left) precision die sets stored in the basement of Seth Thomas Clocks, Thomaston, are covered with rust and grime. At Waterbury-Farrel (top right) this roll-grinder is going to need a complete overhaul—is one of hundreds of machines that were under 18 ft of water; (lower left) the Naugatuck "parked" this car in the shop; and (lower right) drowned these machines

skylight in case we needed to get out in a hurry. We sure did, just a few minutes later.

"We all climbed out onto the roof. All except one guy who wanted to stay on top of a pile of skids, where he thought he was good and safe. Look in there now. Imagine what would have happened to him! Anyway, we got him to come up top with us.

"We all waited on the roof, soaking wet. Didn't know what was going to happen. About an hour later, the volunteer firemen got a boat from somewhere and got to us. The roof felt nice and safe by then and the boat was being tossed every which way. I was a hell of a lot more leery about getting on the boat than staying on the roof, but we all went anyway. The ride wasn't so bad, after all. Funny thing, just before we pushed off, I was hanging onto a window frame. It was a solid, aluminum casement window—and it came right away in my hand. Whew!

"Where did I go then? Why to the other plant across the river, of course. Thought I could at least do some good there. And I wound up getting marooned there for the rest of the night." "One thing, though. I wish we'd thought to move the records higher. There's not a dry record in the place—what's left of them—most of them are lost."

Four days after the flood, they are finding some records. Outside the old plant on the other side of the river, two men are spreading out 3 x 5 blue file cards in the sun, and putting rocks on them to keep them from blowing away. "We found these at the new plant in a steel case. It was pushed from the office about 300 feet to the back end of the plant." They're the pay records for employees whose names begin with N, O, P, Q.

"We use the McBee payroll system," one says, "and the men were paid on Monday morning with wet checks that had been prepared on Thursday for Friday distribution."

Underneath the debris of Plume & Atwood's new plant, some 2000 machine tools, presses, screw machines and other pieces of equipment will have to be dug out, according to P & A President T I S Boak. He's a living legend up in New England, where he's called the "best damn plant manager in the country." He's going to have plenty of chance to earn that title. With one possible exception, size for size, his new plant is the worst hit in the worst industrial disaster this country has ever known.

Plume & Atwood's other-side-of-the-river plant, where its rolling mills are, is on higher ground than the new plant and came off comparatively scot free. Three feet of water rolled over the manufacturing floor, inundating some electric motors. When they've been cleaned and power is back on, this division will be ready to go again. Meanwhile, the roller hearth will be con-

verted to bottled gas instead of city gas because facilities for the latter have been knocked out all along the Naugatuck Valley.

Downriver nine miles from Thomaston is the Naugatuck Valley's major manufacturing center, Waterbury. This is the home of Waterbury Farrel Foundry & Machine Co, where Leo McHugh rescued the drowning electrician, then went back to "do my job." The man at the plant entrance is molder Joe Derouin. It's almost dark and the rest have gone home. No light to work by. Joe and his brother were called in at 4 am Friday to help out and were among those marooned by flood waters. The two of them were in the plant for 28 hours altogether before Assistant Superintendent Steve Holloway came along in an outboard motor boat and took them off.

Six days after the flood, Waterbury's President Joseph M Schaeffer tells you "This is the first time I've been in a business suit since the flood. Been wearing hip boots and work clothes up to now.

"Couldn't Tell How Much Is Lost"

"We're only just beginning to see daylight now. The first thing is the cleanup—right now it's just men and shovels. You can't do much without power and equipment. Next big job is the rehabilitation of machine tools. We'll start that tomorrow or the next day. I've just been down to look at that row of turret lathes in the toolroom. They're all full of sand and muck. I couldn't even tell you how much is lost down there.

"And that big planer: we'll have to take the beds off, clean the tables, ways, housings and motors. Water came up over the top of our big precision boring mills, too. We've already sent out 600 motors to be dried. The way I figure, damage to machine tools will run at least $1 million."

Waterbury Farrel has rigged up power for two floors by the sixth day after the flood, has some materials-handling equipment helping out in the cleanup. But the big trouble is lack of power to operate cranes and elevators. They're on dc and the company needs transformers. Three big generators were sent out to be dried. The smallest of them is due back August 27. W-F's management has its collective fingers crossed because "if it's defective, it'll blow out and there'll be all hell to pay."

"What's the total damage?" this is President Schaeffer speaking, "I haven't the slightest idea. Look at the windows on the Banks St side alone—every darned one is busted. They're special windows. It'll take seven weeks to get new ones. That just shows you the stuff you don't really reckon on. But the thing that floors us most around here is the loss of electrical apparatus. I never realized before how much industry depends on electrical equipment today.

"We have 940 employees. They aren't all back at work. Right now, they'd just get in each others' way. But they'll all be back at work soon. Maybe you don't realize it, but a lot of people up and down this valley use Waterbury-Farrel machines. For some time to come, our No. 1 job will be making replacement equipment for other firms hit by the flood.

"Yes, I heard about those Southerners sending men up here to try and get us to move down South. If there's any truth to it, it's damned poor ethics. You don't kick a man when he's down. It's stupid, too. We're supposed to abandon a $10-million facility here just to please them? If that's the South's idea of help, they'd better stay home.

"Government loans at 3% interest? I heard about that, too. Why should we pay the government 3%? We pay plenty in taxes already. And what about all those free loans to Europe? Don't we rate as much?

"We're a pretty close-knit community up here in New England. And we're pretty darned independent. Like to stand on our own two feet. We've already gotten a lot of help from other firms, from the machine-tool people, and from friends up and down the line. Even got cables from England. Our firm was founded there, you know. Friends over there have offered to do anything they can to help. One customer just got two new machines from us. He won't put them into operation for a couple of months. Darned if he didn't wire and say we could have those two machines to fill orders and send his along later.

"Not only that, a grinding-wheel manufacturer has already told us 'send us all your grinders. We'll refinish them and ship them back at our expense.' Another firm told us it will rehabilitate all our small tools free, and will pay the freight. That's what I call cooperation."

Other plants in Waterbury have suffered incalculable flood damage: like giant American Brass Co and Chase Brass, but size-for-size the worst hit of all Waterbury metalworking plants is comparatively small Platt Bros & Co, a zinc-rolling mill that lies only a few feet above and alongside the Naugatuck River, downstream from Waterbury itself. A new brick, steel-reinforced building held, but the built-in-1901 building that housed manufacturing was completely swept away, leaving only the machine tools and equipment that were firmly anchored to a concrete-based floor. Many huge machine tools and pieces of rolling mill equipment were swept over the edge of a 12-ft-high parapet that separates the plant from the river below. A crane has been in to haul several machines out of the river, but many of them were swept downstream, or buried in silt. Here, too, the river formed an impromptu dam just below the plant, where an old water wheel, long disused but kept for scenic purposes, stood. An oil tank truck was swept down the river and into the wheel, damming up the flood waters.

Down below, in Ansonia and Derby, the river began to lose much of its terrific confined power as its banks widened, but some metalworking industries, like Farrel-Birmingham Co, suffered damage when the river crested at 2 pm Friday afternoon. At Farrel-Birmingham the trouble is mostly soaked motors. They're still being dried out on the sixth day after the flood at F-B's plants in Ansonia and Derby.

At Ansonia, the water coursed through the roll shop and the erecting shop, and into the electrical repair shop, and power house to a depth of about 6 ft over the floor. These floors are some 12 feet above ground level, making the total water depth at the flood's crest 18 ft.

The Good Neighbor

While there's a big cleanup job to be done at the Farrel-Birmingham plants, the feeling around here is "if we get power on, we're in operation." Some 900 of F-B's 1300 employees are in there with brooms, shovels, hoses and anything that'll help the company to get back on its feet in a hurry, because Farrel-Birmingham feels it has a duty as a good neighbor to help worse-hit plants up the valley. Three days after the flood, President Franklin Farrel III and his top management team, dressed in dungarees, took a jeep trip up the valley to see what they could do for their fellow industries. They found plenty to do and they'll do it, because that's the spirit of this valley where hell and high water have done their worst.

Electronics and Automation at San Francisco

Economic and social implications of automation in the electronics industry got a thorough going-over at the NICB-Stanford Research Institute symposium. One prediction: automation may become the No 1 US industry

SAN FRANCISCO—The prediction that within 10 years semi-standardized automation equipment will meet the "common denominator requirements of hundreds or thousands of small and medium sized companies" was made by Paul B Wishart, president of Minneapolis - Honeywell Regulator Co, at a Symposium on Electronics and Automatic Production in San Francisco August 22-23.

Sponsored jointly by the Stanford Research Institute and the National Industrial Conference Board, the symposium was attended by more than 500 officials from nearly as many different companies.

Speakers at the meeting considered the problems and advantages of automation in industry—large and small—and in the military, and explored briefly its social and economic implications.

Mr Wishart, in supporting his views, noted that the manufacturer of automation equipment, knowing that the volume market lies in plants with less than 1000 employees, will attempt to design his wares to fit the needs of small business.

While automation equipment will not be in the class of the shelf item, he said, "I am sure that this logical interest in the broad rather than the narrow market will ease the load on many a small company which wants to benefit from a certain amount of automation but cannot afford the cost of designing and tailor-making all of the necessary equipment."

Biggest US Industry?

In another prediction, Dean E Wooldridge, president of the Ramo-Wooldridge Corp, saw the development of automation itself into one of the largest—"possibly even the largest"—national industry, with an annual income of billions of dollars.

For fastest attainment of the benefits of automation, Mr Wooldridge urged industry to profit from military electronic experience and adopt the "systems" approach now being used in developing complex weapon systems rather than what he termed the "black box" approach.

The systems method in automation, Mr Wooldridge believes, requires use of competent automation systems teams, including management experts along with experts in electronics, servo mechanisms and data handling equipment.

Mr Wooldridge declared that proper employment of this systems approach will take years off what would otherwise be the schedule for a given level of automation—and that conversely "years can be added to the schedule if business and industry make the mistake of assigning overall systems responsibility for their automation programs to purely operational, non-technical people."

Autos and Automation

Speaking on automation in the automobile industry, Robert T Keller, Chrysler Corp vice president heading West Coast operations, said the latest trend is what Chrysler calls "integrated automation." This system uses small, fast, more simply constructed units that can be tied together by mechanical production aids into flexible automation units. Parallel production lines for machining the cylinder block, for instance, are so flexible that blocks can be shuttled from one line to the other at almost any stage of the operation.

Discussing the fear of unemployment resulting from automation, Mr Keller pointed out that while our population will increase by some 25 million in the next 10 years to 190 million, our working force will increase only about 4 million—the largest increase falling in the non-working ages. Meantime, however, we must increase our production 40% within that period "if our standard of living is to continue to improve at the rate it has moved in the past quarter of a century."

In reporting on automation in the steel industry, W K Scott, staff engineer for US Steel Corp, described a new "flying spot scanner," the first production model of which is now being tested. Through use of this device, tin-plate surface defects show up on two television-camera-type tubes as a loss in reflectivity and are classified on that basis. The unit will detect defects as small as 0.020 in. in diameter while inspecting strip as it passes at a rate of 1500 fpm.

Automation and Assembly

In the electronics industry, the needs of the assembler of electronic equipment are presently receiving the greatest attention, Loren F Jones, manager operations programming, Radio Corporation of America, said.

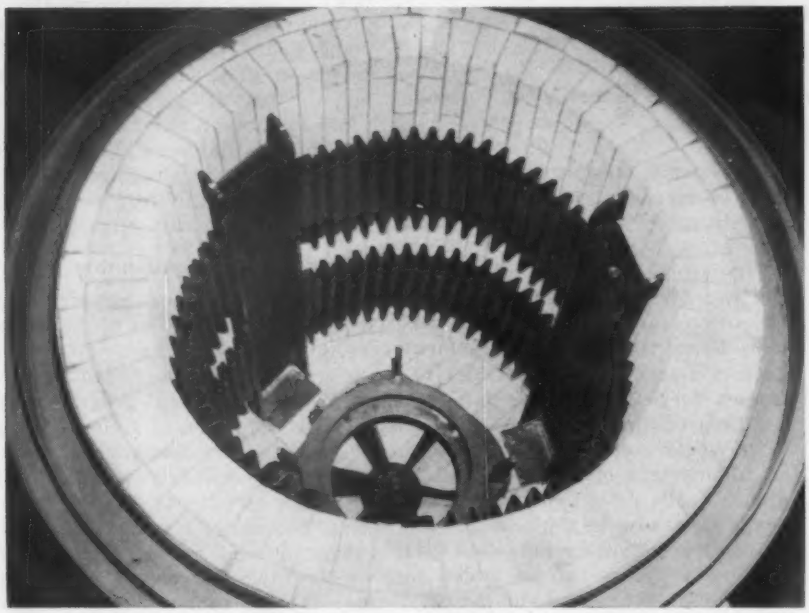
The small-lot assembler of commercial and military equipment is especially faced with complex problems, because of his needs for flexibility. Studies are being made on which of two automation methods to use: (1) the fabrication of components from raw materials integrally with assembly, or (2) the insertion of standard purchased components into printed boards.

Analysis of Logistics

Describing the use of automation in logistics, Rear Admiral F R Furth, chief of the Office of Naval Research, told the symposium audience that advantages to the military as well as to industry and the nation as a whole that should result from the use of electronic data processing systems include:

- Speedy analysis of the logistic implications of strategic plans and industrial capability to back these plans to determine whether the nation can support such an operation. If one set of plans is beyond the nation's capability, another set can be quickly drawn and tested.
- Smoother scheduling of production, and elimination of bottlenecks before they appear, with consequent reduction of demands on the nations' transportation network.
- Reduced burden on American industry, freeing more industrial capacity for civilian production.
- Far fewer clerical employees required by the military for stock and inventory control, freeing manpower for industry.

New Shop Equipment



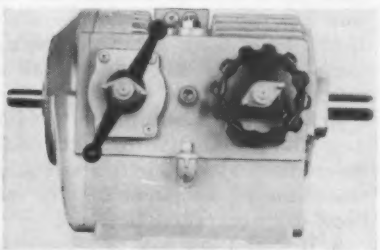
Lindberg Heating Elements In Pit-Type Carburizing Furnace

Corrtherm is an electric heating element for heat-treating furnaces, consisting of corrugated sheets of nickel chromium hung from alloy hooks and covering the walls of the furnace. The manufacturer reports amperage accommodations ten to twenty times greater than in previous elements, producing lower surface temperatures and increased element life.

The low voltage in the furnace reduces leakage, and increases safety to operator. In forced convection furnaces, the elements act as a direction baffle, heating the gases at the same time. Construction advantages are claimed for large furnaces, as the elements can also be suspended into the heating chamber itself.

Further uses in carburizing and carbonitriding are anticipated.

Lindberg Engineering Co, 2450 W Hubbard St, Chicago 12, Ill



Gerotor Adjustable-Speed Hydraulic Transmission

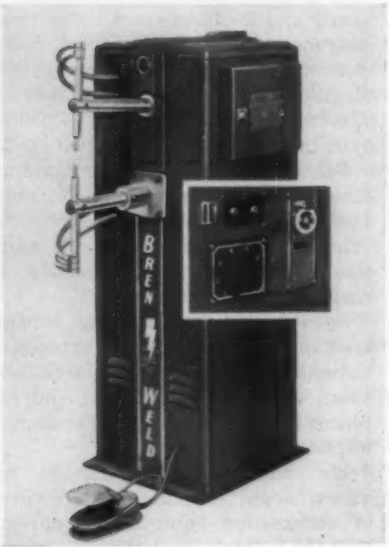
Adjustable-speed hydraulic transmission is applicable to agitators, beaters, machinery, hoists, machine tools, conveyors, mixers, printing presses, starting mechanisms, stokers, and test stands.

Driven oil pump and output oil motor are incorporated in air-cooled housing which also acts as oil reservoir for lubricating working parts. Operating pressure is 300 to 350 psi. It may be directly coupled to electric motor, or belt-driven. Safety valves provide overload protection.

Output speed may be controlled by amount of oil displaced by pump, or by controlling oil consumed by motor, or both. Constant torque may be regulated by stroking pump; likewise, constant horsepower is achieved through stroking motor.

Changes of speed and direction of rotation may be accomplished during operation or while the unit is not operating.

Gerotor May Corp, Maryland Ave & Oliver St, Baltimore 3, Md



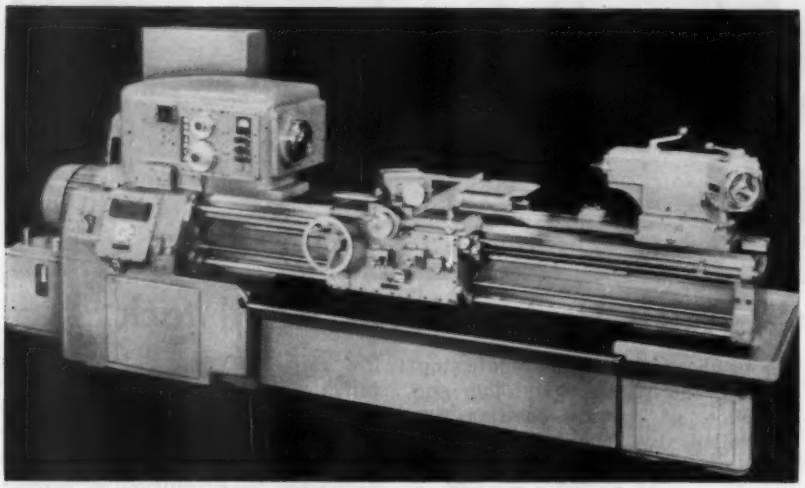
Automatic Spot Welder

Bren/Weld SP-100 spot welder is a 10-kva, air-operated, fully automatic unit which sells at the same price as a standard 5-kva. Model is said to be the first of its type to incorporate an efficiency-increasing toroidal transformer. It welds up to two pieces of ⅛-in. steel.

Features include: repeat, non-repeat operation; NEMA-type 1AX timer; welded structural steel frame enclosed in heavy-gage steel case; heavy-duty, double acting air cylinder with adjustable speed control in both directions; welding horns which can be moved in and out, and rotated 360° for maximum versatility. Controls are mounted on a single side panel. Self-compensating pressure switch eliminates need for adjustments when air pressure is changed.

Kasson Die & Motor Corp, 32-14 Northern Blvd, Long Island City, NY

Materials and Parts . . .



Monarch Dyna-Shift Lathes Cut Heavy Depths on Large Work

Series 90 Dyna-Shift lathe permits operator to pick cutting speed for given diameter with automatic hydraulic shifting of headstock gearing. 36 spindle speeds from 6 to 750 rpm have V-belt motor drive. Spindle has 11-in. American Standard D-1 camlock nose.

Power rapid traverse rate is 185 ipm. Pawl and geared rack mechanism is employed to reposition 7-in. tailstock spindle on the bed ways. Changes in spindle speed to maintain same surface cutting speed on succeeding diameters are accomplished using same controls for setup of headstock located on control panel.

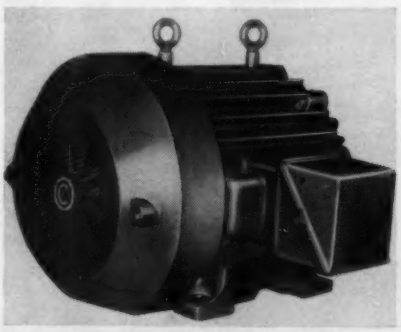
Model 2500 swings 25 in. over cross-slide and has clearance diameter of 40 in. Model 2501 swings 31½ in., has a 44-in. clearance dia. Model 2502 has a 36½-in. swing with a clearance diameter of 48 in.

Series 62 Preselector lathes has headstock control panel which contains dials to select desired surface cutting speed and diameter to be turned on the particular workpiece. No conversion from rpm to fpm is necessary. Indicator on headstock shows spindle speed utilized at all times.

Speeds range from 14 to 1750 rpm. Headstock gearing and bearings are high-pressure mist-lubricated. Main-drive motor is 20 hp.

Model 130 offers a 13-in. swing over cross-slide and has a clearance diameter of 20 in.; Model 131 provides 16-in. swing and 24-in. clearance. Models 1130 and 1131 are equipped with additional accessory equipment for toolroom work.

Monarch Machine Tool Co, Sidney, O



Totally Enclosed Fan-Cooled Motor Uses Six-Layer Insulation

50-hp TEFC motor has six-layer insulation for the stator windings and utilizes plastics and plastic-coated wire. Motor has same efficiency when operated in either direction without changing fan. Rotor is electronically balanced. Line available in 7½ to 100 hp series.

Century Electric Co, 1806 Pine St, St Louis, Mo

. . . including

MACHINE TOOLS AND ATTACHMENTS

Saddle-Type Turret Lathe..... page 182
Engine & Toolroom Lathe..... page 182
Ball-Grinding Attachment..... page 182
1½-ton Bench Press ..... page 183
Hydraulic Tracer Lathe ..... page 183
Spline Roller..... page 183
Aluminum Extrusion Press ... page 184
Ram-Type Miller..... page 184
Arbor Press ..... page 184
Vertical Boring Machine ..... page 186
Traverse Cutting Machine... page 186
Panto-Miller ..... page 186
Cutoff Saw ..... page 188
Powder Metal Press ..... page 188
Centers ..... page 188
Power Press Feed ..... page 190
Special Combination Head .. page 190
600-ton Die Caster ..... page 192
Air Press ..... page 192
Hydraulic Power Unit..... page 194
Powder Metal Press ..... page 196
Screw Slotter..... page 196
Electronic Duplicators ..... page 198
Press Control Arm..... page 198

TOOLS AND ACCESSORIES

Parts Feeder Equipment ..... page 183
Camlock Vise ..... page 184
Saw Bands ..... page 186
Lubrication System ..... page 188
Work Positioner ..... page 190
Catalyst Spray Gun ..... page 192
Impact Wrench ..... page 192
Oil Hole Drills ..... page 192
Rotating Diamond Turner... page 194
Hand Wheel Chuck..... page 196
Hand Tapping Head..... page 196
Bearing Lubricators ..... page 198

WELDING AND HEAT-TREATING

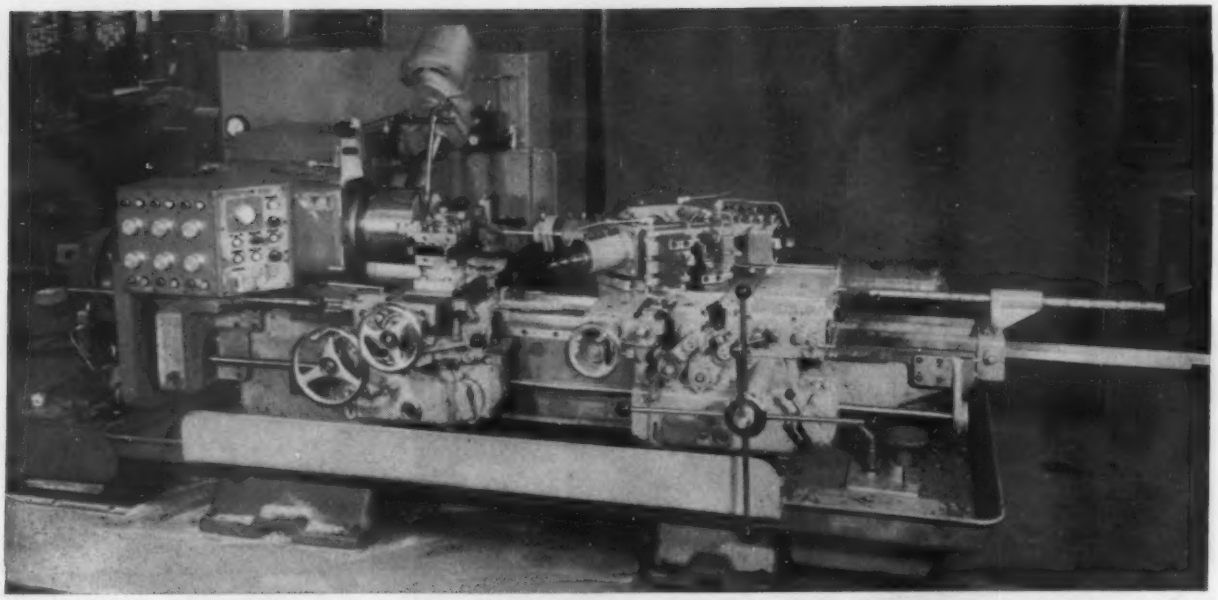
Dew Point Controller..... page 190
Triaxial Welder..... page 194
Atmosphere Controller..... page 196

PLANT SERVICE

Dual-Lift Platform Truck..... page 183
Parts Storage Unit..... page 186
Paint-Spraying Process..... page 198

PARTS AND MATERIALS

Adjustable-Speed Motor..... page 188
Self-Locking Bushing ..... page 190
Rubber Bonding ..... page 198



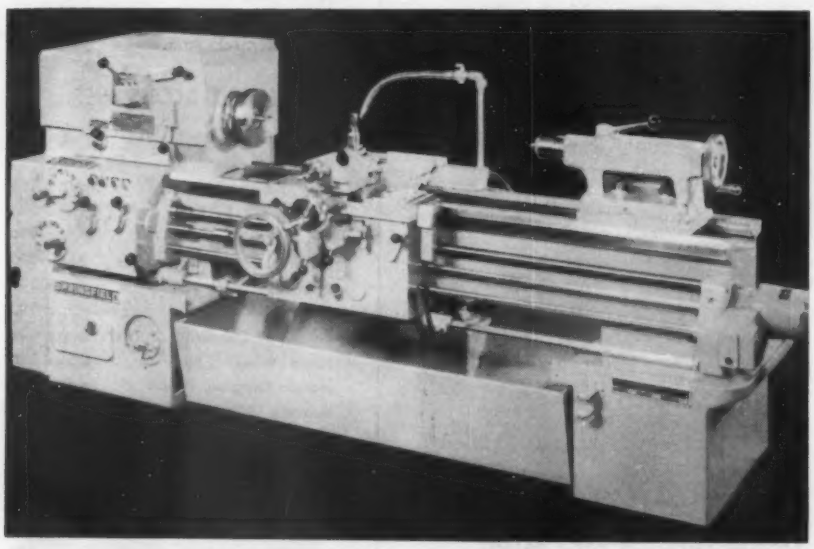
Jones & Lamson Lathe With Hydra-Clutch Headstock

Universal saddle-type turret lathe, with motor indexed through hexagon turret and Geneva mechanism, controls cutting speed, reduces operator fatigue, and reduces machine handling time, according to the manufacturer. The 32 spindle speeds, each with 16 forward and reverse speeds powered by 40-hp motor, can be changed without spindle stop.

Start and stop, spindle jog, and direction of spindle rotation are controlled by pushbutton. Basic speeds available for 2½-in.-hole spindle are 30 to 527 rpm, with a high range of 89 to 1542 rpm. Change gears provide total spread of 18 to 2550 rpm. 4½-in.-hole spindle has low range of 20 to 341 rpm, high range of 58 to 998 rpm; with additional change gears, six ranges give spread from 10.5 to 1491 rpm.

Power indexing is automatic after turret has been returned to contact the adjustable index stop bar.

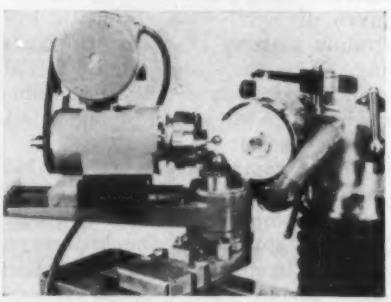
Jones & Lamson Machine Co, 502 Clinton St, Springfield, Vt



Springfield Lathe Dynamically Balanced For Minimum Vibration

Model 280, 16-in., heavy-duty engine and toolroom lathe incorporates totally enclosed head with pressure lubrication to gears; totally enclosed apron and gear box, running in oil; a lightweight unbreakable fiber-glass cover protecting the end gearing; and equilateral triangular girthing of the beds. Controls are grouped and cabinet functionalized. Key rotating parts of the lathe are dynamically balanced.

Springfield Machine Tool Co, Springfield, O

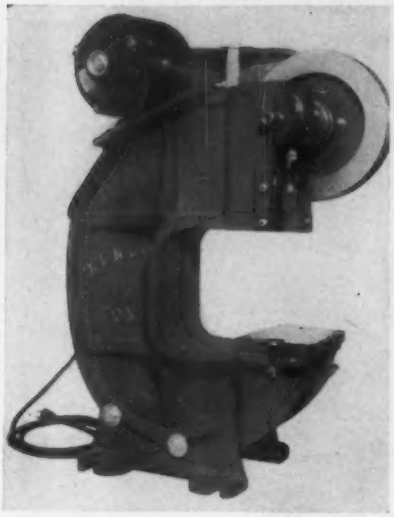


Spherical Shapes Ground With Swedish Attachment

Junger ball-grinding attachment handles spherical plug gages, balls on shaft ends, and various types of circular work. Holds accuracy to 0.0001 in. Diamond setup gage and standard gage blocks are used in setting up for grinding.

Precision 3-jaw chuck has a repetitive accuracy of 0.0001 in. Spherical capacity is 2½-in.-dia; chuck capacity, 1/16 to 3 in.; maximum shaft capacity, 8x⅝ in. Taper hole in workhead spindle is #4 Morse. Reducing sleeves for standard tapers, spring collets, and collet pads are available. Powered by 220-v, 3-phase, 60-cycle, 340-rpm motor.

Nife Inc, Copiague, NY



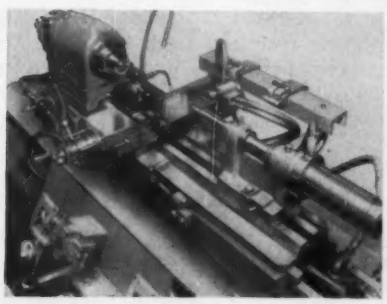
1½-ton Bench Press Requires 2-lb Operating Pressure

7-in. deep-throat press, Model 1R, with a multiple-rib frame is designed for fast, precision stamping. Crankshaft has a ¾-in. stroke. Optional strokes to 1 in. are available at additional cost. V-type ram ways are of Sorbomat construction.

Ram hole is 1 in. in diameter and 1½ in. deep. Ram area is 2¼x2¼ in. Distance from center of ram to back of press is 7 in. Bolster plate is 4⅝x 6⅝x¾ in.

Floor legs, single or double-hand, (or foot) control can be furnished.

Kenco Manufacturing Co, 5211 Telegraph Rd, Los Angeles 22, Calif

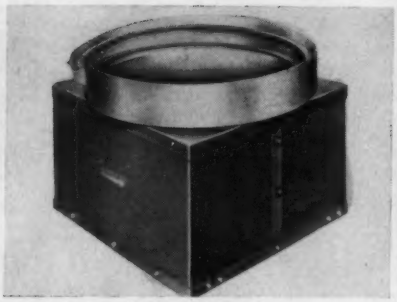


Hydraulic Tracer Lathe

This unit is a hydraulic copying-type lathe used to machine smaller parts in single or production quantities. It has an 11-in. swing, 17 in. between centers, and 13-in. carriage travel. The duplicator crossfeed is 1½ in. and the machine incorporates a spindle drive by a countershaft clutch brake assembly designed for instant starts and stops.

The unit is complete with an air-operated collet closer and tailstock which works from a single selector valve.

Elgin Tool Works, 1770 Berteau Ave, Chicago 13, Ill



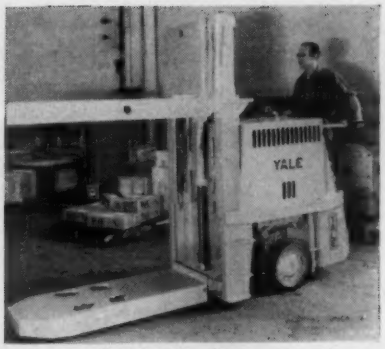
Parts Feeder Equipment

Model EB-2-B vibratory parts feeder has been developed for positioning larger, heavier parts for automatic feeding to all types of packaging and processing machines.

Unit is equipped with a 30-in.-dia fabricated bowl actuated by an electromagnetic reciprocating motor. It is designed to move odd-shaped parts, up to 4 in. long, up and around the spiral track or ramp to single, double, or multiple-discharge points.

Discharge speed can be regulated to suit processing requirements by adjusting a rheostat in the unit's controller, either increasing or decreasing amplitude of vibration. Operation of standard model is 110-60 cycles; 220-60 or 440-60 may be ordered.

Syntron Co, 311 Lexington Ave, Homer City, Pa



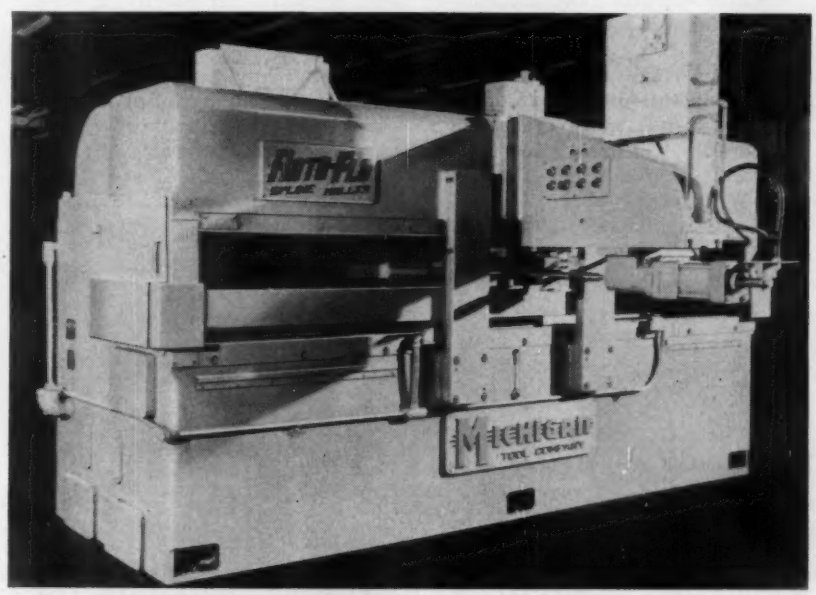
Yale Dual-Lift Platform Truck Moves 2 Skids Simultaneously

This 4000-lb capacity truck is fitted with two independently operating platforms which can be separated to a maximum vertical distance of 62 in. Upper platform fits over bottom in its lowered position giving appearance of a single platform lift truck.

Platform dimensions: upper, 69 x 24 in.; lower, 53 x 21½ in. Upper platform provides a free lift of 35 in. with a max of 69; lower can lift a skid a total of 4½ in.

Over-all height of hydraulic electric truck is 60 in. Each platform can handle a 2000-lb load.

Yale & Towne Manufacturing Co, 405 Lexington Ave, New York 17, NY

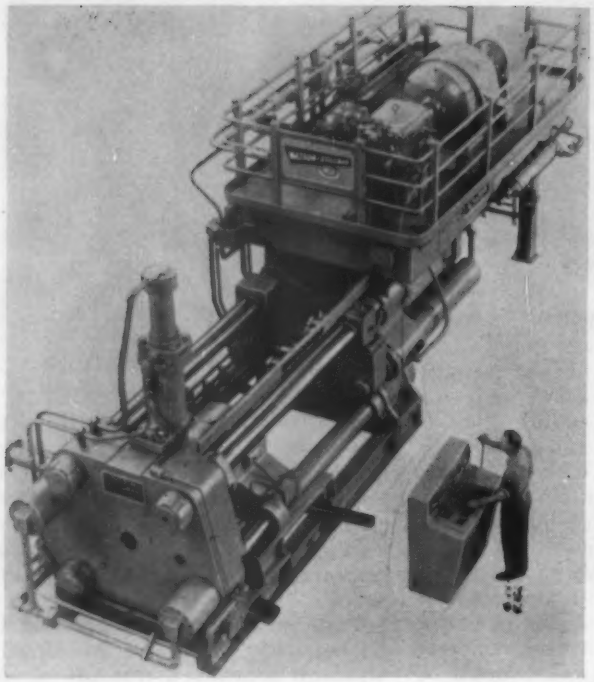


Michigan Tool Develops Spline Roller For Shapes to 2-in.-dia

Model 1551 cold-forming spline roller spans a part diameter range of ½ in. to 2 in. with face width up to 4½ in. on straight, tapered, and helical splines, serrations, and oil grooves.

Roto-Flo forms toothed and grooved shapes on shafts by rolling the piece between two parallel-acting racks. The overarm or tailstock is adjustable for parts ranging from 12 to 36 in. Floor area 135x105 in. Powered by 25-hp motor.

Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich

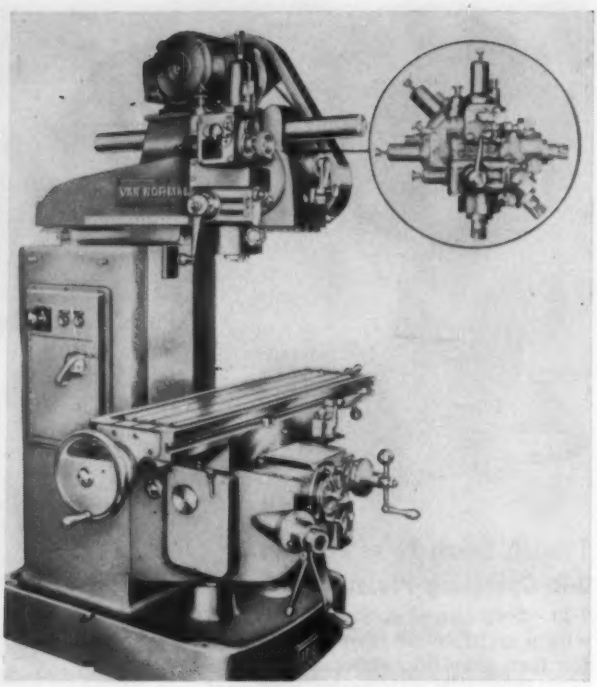


Watson-Stillman 1700-ton Aluminum Extrusion Press

Arranged for automatic and single-cycle control, this long-stroke, oil-hydraulic press accommodates billets up to 27 in. A multiple-piston-type pump with servo motor controls followup and speed adjustment. The pumping unit has direct-drive 900-rpm electric motor. Selector switch provides for automatic or manual operation. Pumping system is directly over main drive motor.

Operating speeds: advance 600 ipm; extrusion 35.5 ipm; return 300 ipm. With runout table, press is 120x 12 ft; 13 ft high. Total weight 100 tons.

Watson-Stillman Co, 109 Aldene Rd, Roselle, NJ

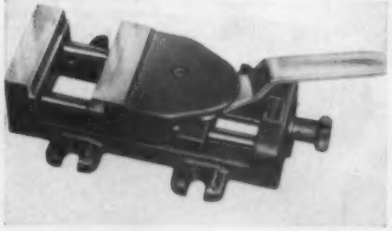


Van Norman Miller Provides Quill-Adjustable Cutterhead

No. 16S ram-type miller has quill-adjustable cutterhead that permits horizontal, angular and vertical milling, boring and drilling. It is reported that production is increased with lower costs.

Adjustable cutterhead has 4-in. quill travel; 3-quill power feed 0.005, 0.003 and 0.006; 8 spindle speeds, 110 to 3600 rpm; cutterhead spindle motor, 2 hp; table size 40½x10 in.; power table travel 22 in.; hand crossfeed 10 in.; vertical feed 22 in.; ram movement in and out over column 20½ in.

Van Norman Co, Springfield 7, Mass



Camlock Vise

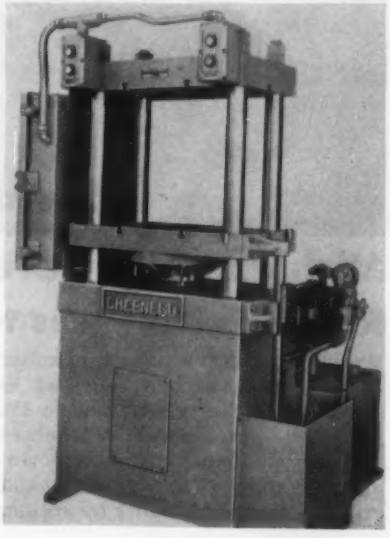
Model 4CL camlock vise can be locked and unlocked with one hand while inserting and removing pieces with the other. Short horizontal movement of the locking lever securely clamps or releases the part. Unit can be converted into a jig or fixture with attachment of special jaws, bushing plates, etc.

The 4-in.-wide jaws are infinitely adjustable to 4⅛-in. opening to accommodate a wide range of work, and for attachment of jig and fixture components. Maximum travel after setting is 5/16 in. Vise is adjusted with screw passing through its center.

Controlled pressure permits holding with a light touch for fragile parts, to 2000-lb squeeze for heavy-duty work.

Design provides wide clearance between jaw guides for drilling clear through work without interference, and ample chip clearance. Hardened and ground V-block accessory is available for use in obtaining a firm grip on both round and oval-shaped pieces.

Heinrich Tools, Inc, 1536 Clark St, Racine, Wis



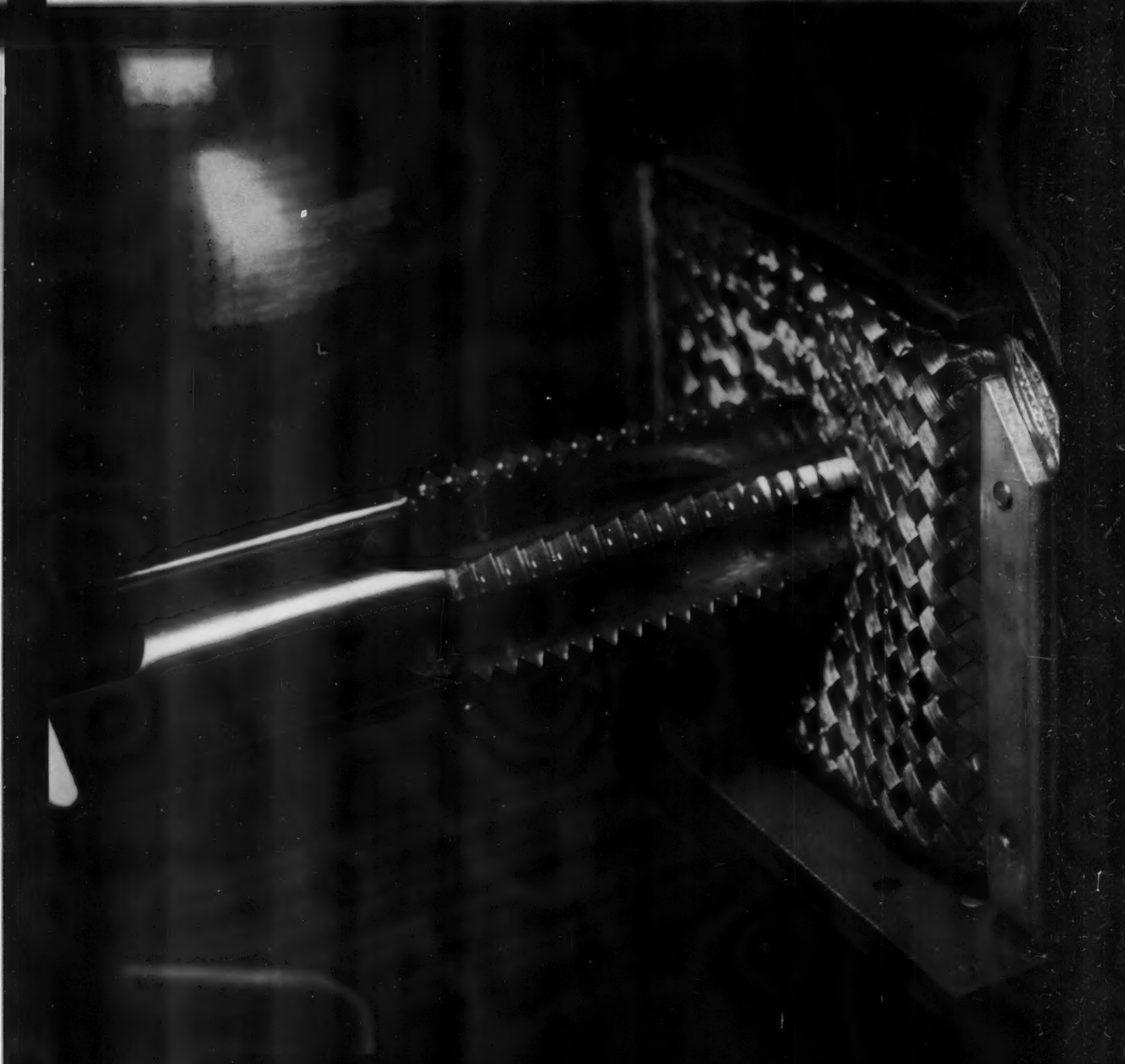
Greenerd Arbor Press Meets JIC Standards

Model UA-4-10, 1½ to 10 ton, up-acting, hydraulic press holds pressure on work without injury to press or hydraulic equipment. Pressure range may be set by adjustment on relief valve.

Features include: 20x14-in. platen; T-slots on top and bottom plates; open daylight 18 in.—closed daylight 2 in.; adjustable return stroke; maximum platen or ram travel 16 in.; direct reading pressure gage. The ram is packed with chevron-type packings, and top and bottom caps sealed with O-rings.

The machine illustrated is equipped with enclosed fan-cooled, 3-hp, 1200-rpm motor and JIC control panel.

Greenerd Arbor Press Co, Nashua, NH

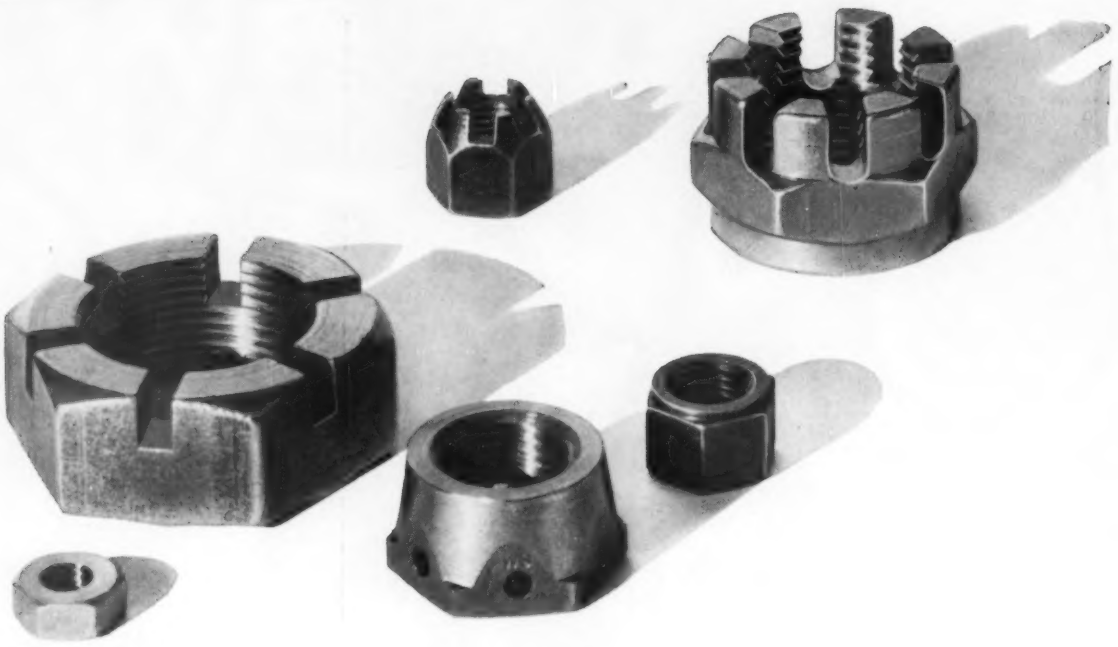


Black Light and Tap Life

Black light enables our engineers and inspectors to literally "see in the dark". Focused on a magnetized tool flooded with a fluorescent solution, it permits the operator to *see* cracks or other surface imperfections not otherwise observable.

This equipment is just another safeguard in the research and quality control programs conducted at GREENFIELD, enabling us to make on-the-spot checks of the performance of new materials or new heat treating cycles, and to give 100% inspection *plus* of tools under test.

Greenfield TAP AND DIE CORPORATION, GREENFIELD, MASSACHUSETTS



Economical way to make nuts . . . out of Youngstown Cold Finished Bars

●Take a look at these nuts. Some of them are pretty complicated. Wood & Spencer of Cleveland, Ohio, uses Youngstown Cold Finished Bars to produce them to specifications at the right price.

When the finish requirements are fussy, these cold finished bars eliminate most grinding operations. They're free of seams. And the chips are small and break off easily. Not the stringy kind that get caught in the cut-off blade on an automatic.

When you order Youngstown Cold Finished hexes, you can be sure they'll be held to the right tolerances. And cracked steel rarely turns up. If you use automatics, it will pay you to use Youngstown Cold Finished Bars. Get in touch with your nearest Youngstown District Sales Office.

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FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI – these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 MILLING MACHINES — *Brown & Sharpe Mfg Co, Providence, RI.* 12-page bulletin MM28 contains information on Rangemaster No. 20 universal and plain machines, sliding-head type; spindle speeds, 40 to 1530. Specifications, dimensions, standard and optional equipment listed; features and applications illustrated.

2 MACHINING ALUMINUM WITH AUTOMATIC SCREW MACHINES —*Kaiser Aluminum & Chemical Sales, Inc, Chicago 1, Ill.* 52-page brochure contains technical data and tooling information on production of parts. Specific data provided on various types of machines, speeds, feeds, and cutting fluids; proper tool angles illustrated; tabular data on tolerances, weights, weight conversion factors.

3 GRINDING MACHINE CENTERS —*Ready Tool Co, Bridgeport, Conn.* 6-page illustrated catalog G-550-1 describes Red-E shank and spindle type anti-friction centers. Basic bearing design, engineering data, construction features detailed. Includes chart for correct selection of center taper specifications for B&S, Landis, Cincinnati, and Norton machines.

4 MULTIPLE BAR AUTOMATIC— *Cone Automatic Machine Co, Windsor, Vt.* 71-page catalog contains descriptive data on Model TK 9/16-in. six-spindle Conomatic for handling work of smaller diameters than previous models in the line. Features illustrated include cross slides independently actuated by master cams, and provided with adjustable work strokes. Specifications provided.

5 MACHINE TOOL AUTOMATION SYSTEM—*Giddings & Lewis Machine Tool Co, Fond du Lac, Wis.* 11-page illustrated bulletin NR-1 describes Numericord system; provides fully automatic control of complete work cycles on multi-axis machines; all machine movements and auxiliary functions controlled by magnetic tape program prepared electronically from numerical data off part drawings.

6 DIMENSIONAL PANTO-MILLER— *Johnson & Bassett, Inc, Production Tool Div, Worcester, Mass.* 6-page brochure illustrates and describes Model 3-A tracer-controlled production machine for pantograph and milling work. Features, specifications, accessories included.

7 ABRASIVE BELT UNIT—*Grinding & Polishing Machinery Corp, Indianapolis 5, Ind.* 6-page bulletin 104 covers G&P Model 6-72 for grinding and polishing operations within capacity of its 2½-in. belt and 2-hp motor. May be used as a primary or auxiliary component of machines in wide variety of adaptations. Applications illustrated; specifications and accessories listed.

8 ROTARY MACHINES — *Niagara Machine & Tool Works, Buffalo 11, NY.* 23-page bulletin 75-B describes line of hand and power-operated machines, rolls, and accessories. Specifications for variety of units given; standard features and optional attachments illustrated.

9 SLITTING EQUIPMENT — *Yoder Co, Cleveland 2, Ohio.* 76-page revised, illustrated catalog covers multiple rotary slitters, uncoilers, recoilers, scrap choppers, and coil cars. Includes selection and operational data; time studies and analysis of operating cycle; specifications; capacity tables; special equipment.

TOOLS AND ACCESSORIES

10 FLEXIBLE SHAFT MACHINES— *Pratt & Whitney, Div Niles-Bement-Pond Co, West Hartford 1, Conn.* 23-page circular 580 contains illustrated descriptions of Kellerflex portable units for filing, polishing, burring, sanding, grinding, wire-brushing, etc. Motor is mounted in separate frame; wide variety of attachments and accessories pictured.

● PRECISION MEASUREMENTS — *Van Keuren Co, Watertown, Boston, Mass.* 258-page illustrated, revised catalog and handbook No. 36 contains technical and engineering data on problems and methods. Includes formulas for screw thread measurement, gear tables, circular pitch wire sizes, optical flat specifications, etc. Contains information on company's new products for precision inspection. Request direct on company letterhead.

11 ROTARY FILES—*Grobet File Co of America, New York 13, NY.* 16-page catalog illustrates files for hard and soft metals, plastics, wood, and other materials. Includes chisel cut, ground-from-solid, and tungsten carbide units, as well as countersinks and rasps in wide range of sizes, shapes, and cuts.

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FOR YOUR INFORMATION

12 DIAL INDICATORS, GAGES, INSTRUMENTS—*L S Starrett Co, Athol, Mass.* 80-page bulletin 416 describes and illustrates line. Includes data on 140 models; specifications, attachments, accessories.

13 GRINDING WHEELS — *Sterling Grinding Wheel Co, Tiffin, Ohio.* 29-page illustrated general catalog 1-5, containing revised price lists; includes specifications, descriptions, recommended wheel speeds for stock abrasive items for variety of applications.

14 DIAMOND TOOLS — *Permattach Diamond Tool Co, Milford, NH.* 4-page illustrated bulletin describes tools made with new method of mounting diamond. Process of fusing stone to tool by chemical union eliminates need for imbedding ¾ of diamond. Stones of any size and shape can be surface mounted, resulting in complete utilization of diamond.

15 DIRECT ANGLE & CIRCLE MEASURING UNITS—*Ingis Equipment Co, Chicago 5, Ill.* Data chart No. 5506 lists for quick reference the essential specifications and performance of specialized instruments for exact measurement of angles and circular spacings.

16 MAINTENANCE, SAFETY, PRODUCTION EQUIPMENT—*Martindale Electric Co, Cleveland 7, Ohio.* 64-page catalog 30 illustrates and describes lines of metalworking tools; products for commutator, motor and generator, electrical and mechanical maintenance; flexible shaft machines; and safety equipment.

17 HAND GUN RIVETER — *Lemert Engineering Co, Plymouth, Ind.* 4-page illustrated bulletin 86P covers rotating impact spinner-riveter and other models of all-pneumatic Airflex portable series. Construction features and specifications included.

18 BRUSH - BACKED POLISHING HEAD—*Grinding & Polishing Machinery Corp, Indianapolis 5, Ind.* 6-page bulletin 102 provides illustrated data on Vonnegut head for finishing operations. Applications pictured, specifications provided.

HEAT TREATING AND WELDING

19 SALT BATH FURNACES—*Hevi Duty Electric Co, Milwaukee 1, Wis.* 4-page bulletin 655 illustrates features of Bellis immersed electrode units, temps 300 to 2300F. Advantages, applications, construction details included.

20 AIR - OPERATED, PRESS - TYPE SPOT WELDER—*Sciaky Bros, Chicago 38, Ill.* 8-page folder provides data on PMCO 2 ST 3-phase Modu-Wave. Design features, advantages described; standard and optional equipment listed; specifications provided.

21 IMMERSION HEATING EQUIPMENT — *Eclipse Fuel Engineering Co, Rockford, Ill.* 4-page folder H-11 describes method applicable to low-temp metal melting; heating plating solutions, etc. Data on selection, sizing and installation, heat loss, burner selection tables.

PLANT SERVICE EQUIPMENT

22 OIL-HYDRAULIC PUMPS, CONTROLS, ACCESSORIES — *Vickers Inc, Detroit 32, Mich.* 56-page illustrated catalog 5001A includes engineering, design, and application data on each category. Operational details, application recommendations, selection, and purchase information; ratings, capacities, performance curves in tabular form.

23 MATERIALS-HANDLING EQUIPMENT — *Lewis-Shepard Products, Watertown, Mass.* Package contains 25 folders of case studies describing and illustrating applicationse of variety of available equipment. Includes solutions of miscellaneous handling problems, cost cuts, storage space.

24 FEATHER VALVE COMPRESSORS —*Worthington Corp, Harrison, NJ.* 31-page bulletin L-676-B1A covers units from 75-350 hp. Advantages in installation, operation, maintenance outlined for types YC and DYC compressors. Data and illustrations on component parts; 5 and 3-step variable capacity control; governors; auxiliary equipment; accessories.

25 ROLLER CONVEYORS — *E W Buschman Co, Cincinnati 32, Ohio.* 19-page catalog 60A contains illustrated description of Series 60 medium and heavy-duty units. Specifications and capacities of rollers and bearings. Construction data, and installation information provided.

PARTS AND MATERIALS

26 ARC-CAST MOLYBDENUM — *Climax Molybdenum Co, New York 36, NY.* 72-page illustrated booklet is a compilation of all available technical and fabricating data on material and its alloys. In addition to high-temp applications, discussions include physical and mechanical properties; corrosion and oxidation resistance; fabrication of parts; weight tables.

27 FLEXIDYNES: DRY FLUID DRIVE —*Dodge Mfg Corp, Mishawaka, Ind.* 11-page bulletin A-640 illustrates and describes the Flexidyne; "fluid" is heat-treated steel shot. Operating advantages, general characteristics, selection charts, recommended V-belt drives for all sizes.

28 SCREW MACHINE PRODUCTS WEIGHT TABLE—*Scovill Mfg Co, Mill Products Div, Waterbury, Conn.* Estimates weight of Scovill high-speed, free-cutting brass rod required for fabrication. Pounds per 1000 pieces per inch for round, square, and hexagon rod in diameters from 1/16 to 3½ in; weight conversion factors for 28 other copper-base alloys.

● ARCHITECTURAL ALUMINUM— *Reynolds Metals Co, Louisville 1, Ky.* "Reynolds Architectural Aluminum Portfolio," 101-page 1955 edition, gives sizes, weights, alloys, tempers of items available; recommended method of applying the part involved; miscellaneous extruded shapes; structurals; manufacturing size limitations for extruded shapes, rod, and bar with reference to different alloys and tempers. Request direct on company letterhead.

29 AIR FILTERS & LUBRICATORS— *Master Pneumatic, Inc, Detroit 34, Mich.* 16-page illustrated catalog lists sizes and types for pneumatic equipment. Principles and methods of air filtration discussed; installation and maintenance; dimensions sheet and parts list included.

30 ENCLOSED SWITCHES — *Micro-Switch, Freeport, Ill.* 28-page illustrated catalog 83 covers complete line designed for ac or dc applications; includes general purpose; sealed; heavy-duty limit; hand - operated; and maintained - contact switches. Circuit diagrams, electrical data, and technical information provided.

31 "TOOL STEEL FOR THE NON-METALLURGIST" — *Crucible Steel Co of America, Pittsburgh 30, Pa.* 44-page illustrated booklet discusses the six basic classifications; covers properties, application recommendations, heat-treating technique, tabular data.

The manufacture of circular weldments — rings and bands — has been an American Welding specialty for 37 years. Here you will find the men, the know-how and the equipment to form, weld and machine circular components for a wide variety of end products. Big ones (96 inches) or small ones (6 inches), of ferrous or non-ferrous metals including Titanium* or Aluminum, in production runs of hundreds, thousands, or ten thousands.

If your problem is "round and metallic" consult our Industrial Products Division. Write or call today — we will be glad to work with you.

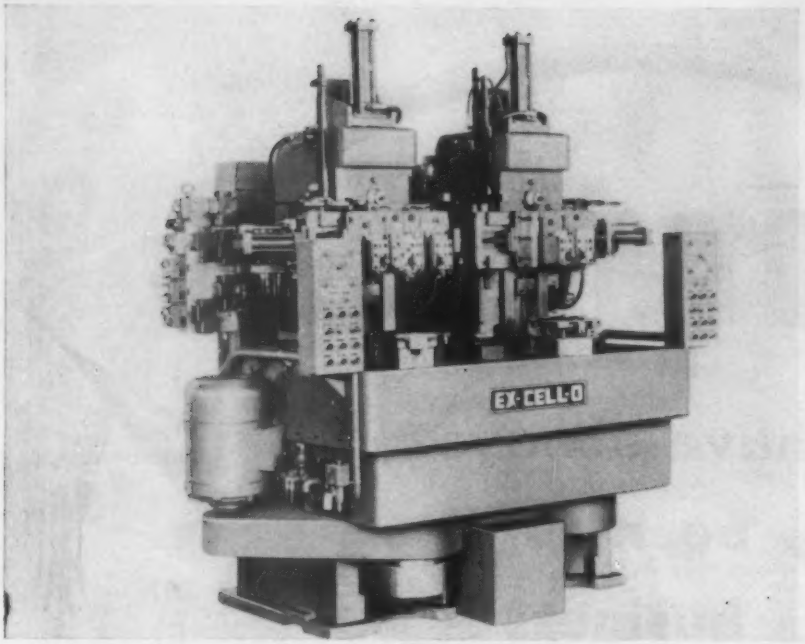
*First successful Production Welding of Titanium Alloy was accomplished by American Welding in 1949.

Production Facilities Catalog

Find out what American Welding can do for you. Send for FREE Catalog today.

AMERICAN WELDING

THE AMERICAN WELDING AND MANUFACTURING CO. • 400 DIETZ RD. • WARREN, OHIO



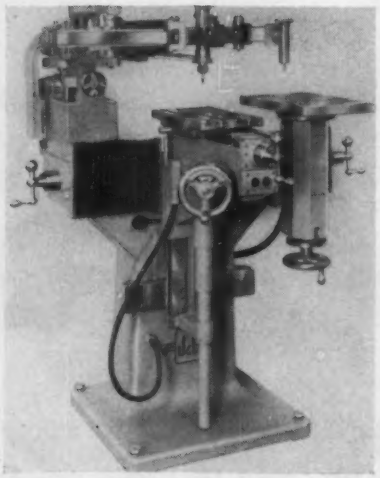
Ex-Cell-O Vertical Boring Machine Runs Two Independent Cycles

Style 432 vertical precision boring machine performs such operations as turning, boring, facing, grooving and chamfering in combinations or as separate operations. Each of two stations has a separate hydraulic system, counterweighted compound tool slide, vertical spindle, drive equipment and controls.

Vertical construction provides convenience in loading and unloading work and adjusting or changing tools. Spindle shafts are hollow to permit drawbar or pneumatic-chuck operation. The machine base is designed for easy chip disposal. Spindle speeds are changed with V-belt and pully combinations. Desired machine cycles are obtained by positioning selector switches, adjustable dogs, and orifices.

Simple setup of smooth and versatile cycles with easy operation and high productivity are claimed.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich

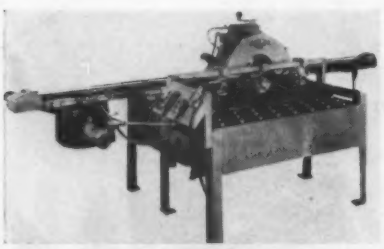


Pantograph Ratio Is Reversible In Johnson & Bassett Miller

Model 3A "Panto-Miller," a tracer-controlled production machine, is designed for engraving, profiling, die cutting, and milling. Pantograph ratios vary from 1:1.5 to 1:10, and cutter and tracer heads may be transposed for enlarged reproductions. A special aligning bar and forming guide bracket are standard equipment.

The Panto-Miller offers new advantages in work-handling capacity, especially in the thickness of workpieces accommodated. Spindle speed is infinitely adjustable from 1000 to 12,000 rpm. The ground worktable surface is 8x14-in. The copy-table top, also machine-ground, is 10½x 16 in., and swivels 360°.

Johnson & Bassett, Inc, Worcester, Mass



Traverse Cutting Machine Has Locking Roller Assembly

Model SS-20LR for cutting ferrous and non ferrous plate and sheet stock has a new locking roller assembly that locks it to a special channel-type rail. Close integration of rail and machine is said to provide greater rigidity and control over the cutting job, and to assure longer wheel life with less breakage. In climb cutting, all chips, dust, and sparks are disposed of through the kerf in the table.

Abrasive wheels are used in the cutting of ferrous metals; circular steel saw blade is employed for cutting non-ferrous metals and non-metallic materials, such as plastic, melamine, and masonite. Saw blades are lubricated by directing the oil mist spray at the point of contact between blade and material. Machine can cut both away from and back to the operator, eliminating need for adjusting to starting position.

Unit can cut ¼-in. stainless plate 4 ft long in 30 seconds; ¼-in. aluminum plate 49½ in. long in 9 sec; 1-in. melamine stock at rate of 100 sq in. per minute; 1½-in. laminated plastic at 10 sec per ft. Machine is engineered to hold tolerances to 0.010 in.

Stone Machinery Co, Manlius, NY

Demon HSS saw bands are now being produced in the Claw Tooth design, with positive rake teeth. Metallurgical characteristics permit it to flex over the carrier wheels of a band machine; it retains its high tooth hardness at temperatures to 1050 F. Available in four widths from 1/4 through 1 in., and in four pitches, 2, 3, 4, and 6 teeth per in.

The DoAll Co, 254 N Laurel Ave, Des Plaines, Ill

Module unit for parts storage and assembly operations measures 14 in. deep, 28 in. long, 30 in. high, is heavy gage steel. Drilled holes permit grouping of stands into various units with connecting shelves for large or small work areas. Level top work area permits attachment of bench top bin units.

Bathey Manufacturing Co, Plymouth, Mich

SOUTH BEND VALUE PAYS OFF IN ACCURACY AND PRODUCTIVITY

It's the value built into South Bend Lathes that adds the extra precision, adaptability and dependability that makes them so popular. This also brings to metal working operations an accuracy and productivity that means better products at lower costs.

South Bend Lathes have been doing this for years and years. They have been the choice of cost-conscious management for their efficiency and low up-keep. Machinists like them for their easy operation and ability to hold tolerances.

Take advantage of South Bend features and get lower machining costs as countless others have. Let our nearby distributor help you do this by showing you how you can best use South Bend Lathes.

Illustrated: 16″ x 6′ Quick Change Gear Lathe. Price $2151 f.o.b. factory, less electrical equipment, chuck and taper attachment. Time payment terms, only 3¼% annual interest on original unpaid balance.

New Catalog

Describes 9″ to 16-24″ Lathes, ½″ and 1″ collet Turret Lathes, 14″ Drill Presses, 7″ Bench Shapers and Pedestal Grinders. Ask for new Catalog 5406.

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941

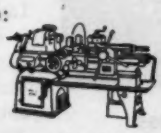
Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

PLEASE SEND INFORMATION CHECKED:

☐ 9″ and 10″ BENCH LATHES

☐ 10″ to 16-24″ FLOOR LATHES

☐ DRILL PRESSES



☐ ½″ & 1″ Collet TURRET LATHES

☐ TOOL GRINDERS

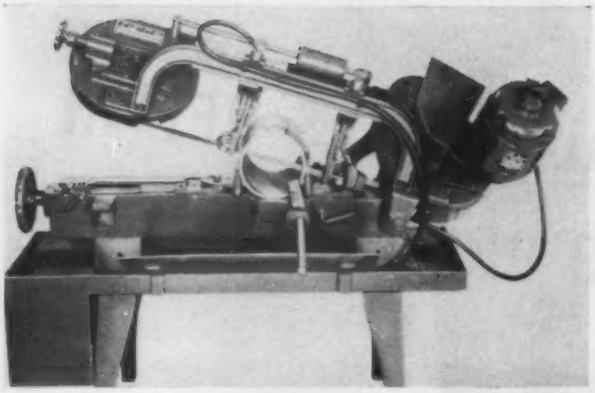
☐ 7″ BENCH SHAPERS

Name_____ Street_____

City_____ State_____

SOUTH BEND

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana



Wells Announces Increased Capacity Cutoff Saw

Model 600 horizontal bandsaw is designed for metal cutting on medium production jobs, general utility, or tool and stockroom work. Its rectangular capacity is 6x13 in. and will handle 6¾ or 6-in.-dia pipe. The blade is 8 ft 2½ in. x ⅝ x 0.032 in. Speeds are 50, 90, 160 or 250 fpm. Floor area is 21x50 in. and bed is 25½ in. high.

Features include: constant-load blade tensioning; safety switch, with thermal overload protection and automatic stop after each cut; adjustable, uniform gravity feed of counterbalanced frame; cast-iron frame and I-beam; V-belt drive with four speeds; adjustable guides for stabilizing the blade; sealed ball-bearing motor.

Wells Manufacturing Corp, 505 Roosevelt Rd, Three Rivers, Mich

50-ton Powder Metal Press

Multiple-motion Model 640 is designed for production of complex multiple-level parts, and parts with inserts.

Unit has a single upper punch motion and two lower punch motions with a stationary core rod. Lower motions are both actuated by a single compression lever which applies upward pressure with a positive force, doing mechanically what would otherwise be accomplished by spring-loaded punches. Motions are designed into the press for simpler tooling and more flexible, accurate adjustments.

Full 50-ton pressure is applied to the upper and the outer lower punches. Inner lower punch has a maximum pressing force of 30 tons; core rod supporting pressure is 10 tons. Compression and ejection actuating systems are separately and independently adjustable. For instance, a change in the depth of fill does not require change in ejection level. Handwheel controls, calibrated to read in thousandths of an inch, regardless of stroke position, provide independent adjustment of both inner and outer lower punches and the upper punch. Adjustments can be made at any point in the cycle, except full compression, even while press is running.

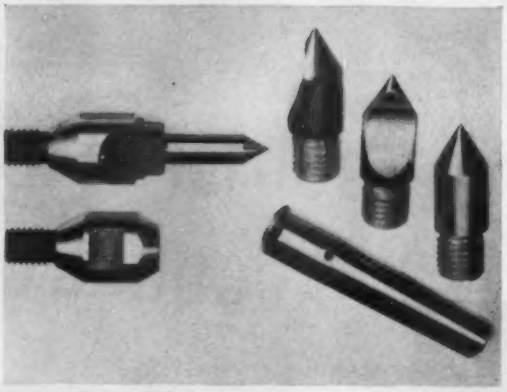
All working parts and drive motor are completely enclosed. Lubricating system is automatic; safety switch stops operations if oil supply should drop below predetermined minimum level.

F J Stokes Machine Co, 5500 Tabor Rd, Philadelphia 20, Pa

G&L Lubri-Cool System Cuts Temperature-Size Variation

Lubri-Cool applied to a machine tool is said to cut variations in temperature in machine spindles and milling units, to reduce the effect on accuracy of ambient-temperature rise. Although unit does not maintain constant temperature in lubricated area, the system is intended to control the rise in temperature so it corresponds to rise in outside-area temperatures.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis



Boyd Center Has Removable Nose

Boyd line of standard centers for lathes, grinders, or screw machines incorporates a detachable nose that can be removed from the shank, ground separately, and returned without changing exact centering. Shank remains in the spindle of the headstock or tailstock, reportedly will last the life of the machine.

Since the center is not ground on the machine where it is in use, danger of abrasives fouling the lubricant is eliminated. Standard noses are made of high-speed alloy steel, heat-treated to R_c 63 to 65 accurately ground. Carbide-tipped noses are also available. Shank is tool steel, hardened and ground, with a frustro-conical taper to fit the nose and maintain precision centering. When center is assembled, axis of nose and shank are coincidental.

Set includes one shank and three standard noses; wide range of special noses is available. Adapters can be furnished to replace the nose where a Jacobs chuck or similar device is used.

Teaman Precision Products, 1426 W 3rd St, Cleveland 13, Ohio

Bogue Adjustable-Speed Motor Uses Electrical Controls

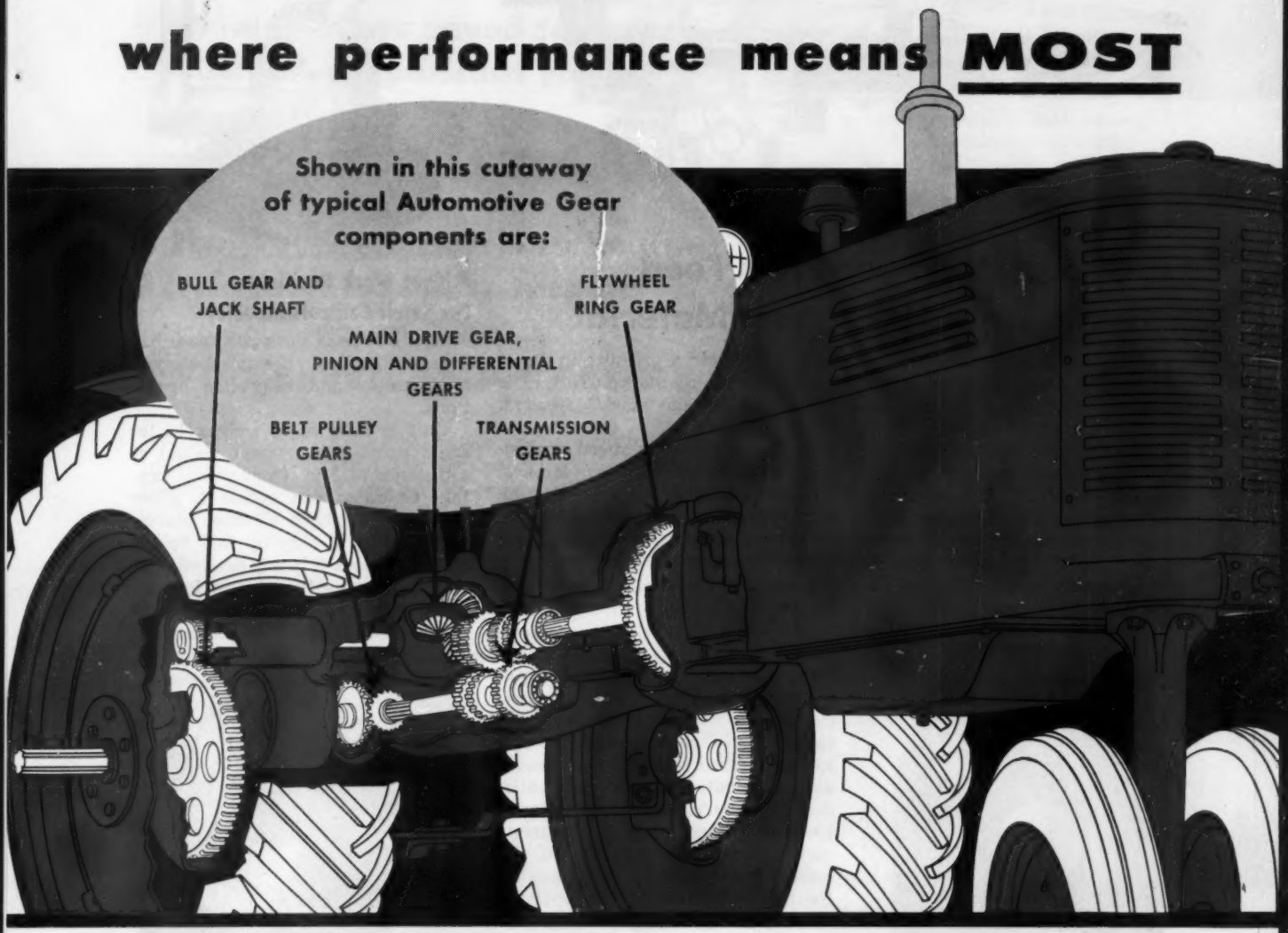
N-S adjustable speed ac motor is designed with electrical controls; gears and mechanical drives are eliminated.

Controls ranging from completely automatic through semi-automatic, to manually operated, are said to maintain motor efficiency under conditions involving sudden stops, to reversing or inching. Motor can provide from 0.5 to 1000 hp with speed ranging from 30:1 to 1.5:1. Operates on 3-phase ac power of 50, 60, or 400 c; specifically adapted to high starting torque loads.

Bogue Electric Manufacturing Co, 52 Iowa Ave, Paterson, NJ

GEARS

where performance means MOST


Shown in this cutaway of typical Automotive Gear components are:
BULL GEAR AND JACK SHAFT
FLYWHEEL RING GEAR
MAIN DRIVE GEAR, PINION AND DIFFERENTIAL GEARS
BELT PULLEY GEARS
TRANSMISSION GEARS

When gears are used to transmit power there's no standard of comparison equal to on-the-job-performance. This is particularly true of farm machinery, where the dependability of gears is essential in maintaining the planting, cultivating and harvesting schedules.

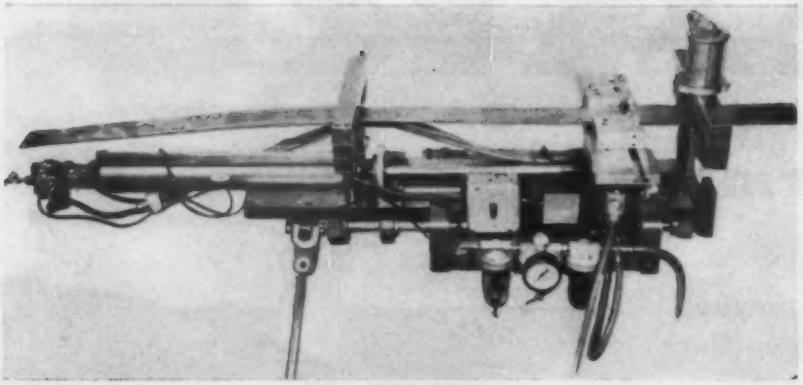
Automotive Gears are used in a wide variety of the best-known, best-made farm machines. Their record is worth your inspection—no matter what your gear problem may be. This is particularly true if you are considering a source with the experience, the engineering service, and the facilities to serve as your "gear department." Just write or phone.

DOUBLE DIAMOND GEARS

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

Automotive Gear Works, inc.

ESTABLISHED IN 1914 — RICHMOND, INDIANA



Air Operated Power-Press Feed Prevents Work Hardening Material

Micro-Air supplies feed in lengths up to 48 in. with a transformer that reduces line current to 8 v. As with the crankshaft-operated Micro-Slide feed, spring-loaded rollers make direct contact from top and bottom with the material fed. Cammed rollers prevent the material from moving back, aided by an air cylinder that checks on the backstroke.

No adjustments are necessary for different thicknesses of stock, as the rollers maintain a pressure in direct proportion to resistance. Torque is eliminated by the stock's freedom to move laterally.

Features include: speed adjustment on forward and return strokes; built-in non-repeat feature which operates press; pneumatic shock absorber on carriage; safety foot valve with two-position locking action.

Nadel Manufacturing Co, 20 Warren St, New York 7, NY

Midget Work Positioner For Small Controls Industry

Midget PowRam work positioner has been designed for the smallest type of assembly and inspection operations.

Unit is 2 in. high, weighs ½ lb; can support 5 lb of work weight at a distance of 3 in. from swivel center. Operator can rotate a given work unit freely in all three planes, including right side up and upside down, and lock it in any desired position by moving the control lever.

Wilton Tool Mfg Co, 9525 Irving Park Rd, Schiller Park, Ill

Automatic Dew Point Controller

Controlling, recording, and proportioning instrument enables heat treater to set atmosphere generator or furnace in equilibrium with any steel to be processed. Operator sets pointer on the control instrument for the carbon content of the steel; Carbotrol automatically controls generator to produce a protective atmosphere.

Instrument also eliminates disadvantages of operating an endothermic generator on a raw gas supply, which varies in analysis throughout the day. Air-gas ratio of the generator is corrected to produce a constant dew point, or carbon potential, as raw gas supply and pressure varies.

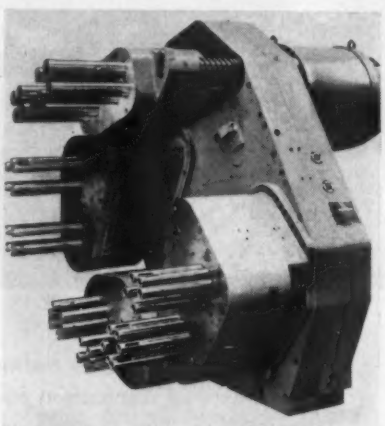
Used in conjunction with Lindberg "Hyen" atmosphere as a carrier gas, instrument automatically controls carburizing and carbonitriding processes to produce carbon in the case to any desired specification. Soot is also eliminated during the entire cycle. Carburizing cycle is greatly shortened, according to the manufacturer, for any case depth, and cleaning operations are eliminated. Neutral hardening, bright copper or silver brazing of medium and high carbon steels, carbon correction, sintering of powdered metals, and other processes using endothermic generator gas are also automatically controlled.

Operates on 115v, 60c ac; 20 to 150-lb air pressure.

Lindberg Engineering Co, 2450 W

Self-locking bushing, vibration-proof, is designed for use in relatively soft castings, forgings, and extrusions. ESNA Type 2424 is available in two designs: Type N2424 with red nylon locking collar for temperatures up to 250 F, and Type LH2424 all metal locking device for temps between 250 and 550 F. Bushings develop minimum ultimate loads of 140,000 psi, based on internal thread size. Available in 10-32, 1/4-28, 5/16-24, and 3/8-24 internal thread sizes.

Elastic Stop Nut Corp of America, Union, NJ



41-Spindle Combination Head

Special head consists of a master drive box which operates in horizontal position, mounted and keyed on a hydraulic slide; 11-spindle pot head for drilling; 11-spindle pot head for chamfering; 11-spindle pot head for reaming; and 8-spindle individual leadscrew pot head for tapping ½ in.-20 holes in steel forging.

First three pot heads are driven through the master drive box by a 15-hp motor through a flexible coupling.

Unit operates in conjunction with a 5-station trunnion-type fixture.

US Drill Head Co, 616 Burns St, Cincinnati 4, Ohio

time studies prove it!

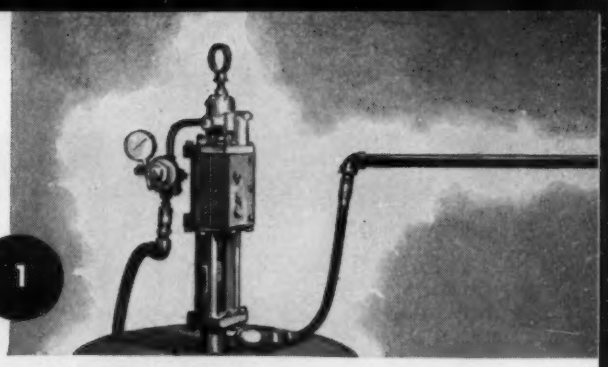
95 man-hours saved for every 400 lbs. of lubricant you use!

Alemite cuts costs!

all the way from barrel to bearing ...in maintenance...repairs... down-time... YOU SAVE...STEP BY STEP!

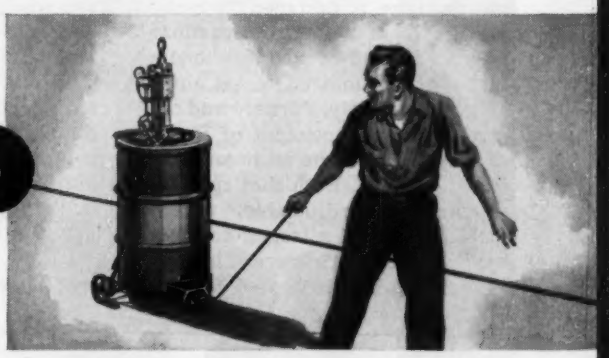
With operating costs sky-high, any saving is important. And with this Alemite lubrication system you *start* with a saving of 95 man-hours for every 400-lb. drum of lubricant used. And far more important than this initial saving is the saving in *machine hours*—decreased maintenance costs—increased efficiency and output.

Alemite Barrel Pumps fit directly into either a 400 or 100 pound drum, send lubricant wherever it is needed anywhere in the plant. Or drum and pump can be placed on a wheeled dolly to go right to the machines. You get the big advantage, the protection, of a completely sealed system. Lubricant reaches bearings "refinery clean," with no mess or waste.



An Alemite Barrel Pump, either air or electric powered, is inserted in a fresh drum of lubricant. Lubricant is still sealed—"refinery fresh."

Now the Barrel Pump supplies lubricant, through pipe, anywhere in the plant. Operator simply carries a hose and control valve to the outlet, hooks it in, applies lubricant.



Where piping of lubricant is not practical, power lubrication can be brought right to the machine by simply mounting drum and pump on a dolly.

Machines get the time-saving protection of power lubrication regardless of whether pump is portable—or stationary for piped systems or overhead reels.

With Alemite Plan "D" Lubricant is "Refinery Clean" Wherever Applied!

These applications of Alemite Barrel Pumps to provide tailored power lubrication are known as Alemite Plan "D". This is one of the five Alemite plans that your trained Alemite representative can show you. Ask him for your free copy of the new Alemite booklet, "5 Plans for Better Plant Lubrication"—or use the coupon at the right. It will show you how to save money in your plant!

FREE! **New Booklet: "5 Plans for Better Plant Lubrication"**

Alemite, Dept. C-95, 1850 Diversey Parkway, Chicago 14, Illinois

Please send me my FREE copy of "5 Plans for Better Lubrication."

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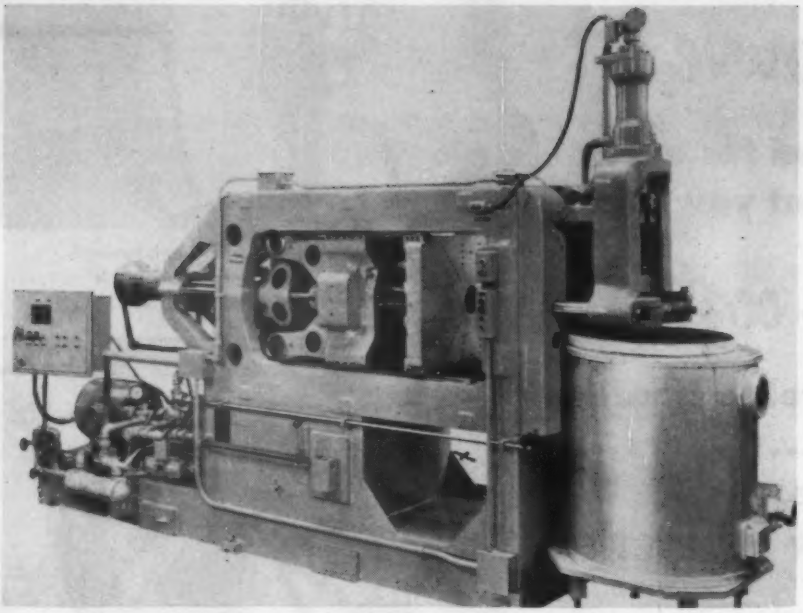
A PRODUCT OF STEWART WARNER

Ask Anyone in Industry

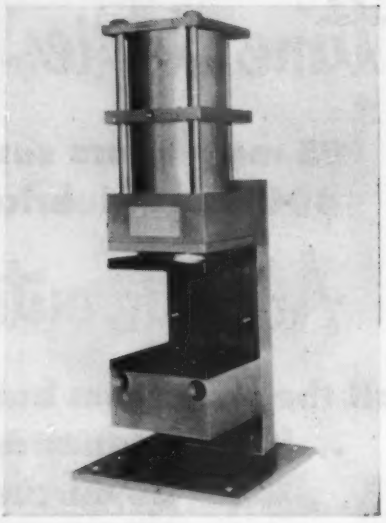


Lester Phoenix 600-ton Die Caster Produces Zinc Castings to 15¼ lb

The HP-3Z-SF 600-ton zinc die-casting machine is designed to cast up to 15¼ lb of zinc or proportionate weights of lead or tin. Only one adjustment is required to set up the zinc end correctly. Furnace and melting pot are independent of the machine and said to be large and easily fed or emptied. Both shot speed and pressure are adjustable, with an ASME-approved nitrogen accumulator giving high-speed injection. Plunger tip is heat-treated steel with piston rings. Two fixed shot positions are provided.

Pre-loading clamping pressure is accomplished by a one-piece alloy-steel frame with beam area equal to 8-in. tie bars. Die setup is aided by a single crank die-height adjustment. Die opening is 14 in. The movable platen unobstructed is 40 in. wide, with a vertical clearance between the beams of 28 in.

Lester Phoenix, Inc, 2711 Church Ave, Dept N-41, Cleveland 13, Ohio



Rugged Air Press

Vi-Speed air press, Series P66, has a 6x6-in. platen guided by a 5-in. piston rod, and powered by a 5-in. cylinder with either 3 or 6-in. stroke. Units are designed for die sets, punching, swaging, press fitting, light bending and forming, crimping, wire splicing, and light forging. Four standard models are available with 3-in. vertical, adjustable clearance.

Ram provides a maximum of guiding surface for maintaining close tolerances on all pieces, including those held off-center. Presses are furnished with either single or double power, providing 1900 or 3800-lb thrust at 100 psig; working pressures range from 15 to 150 psi. Models are available with an air return where heavy fixtures are to be attached to the moving platen. By removing baseplates they may be used horizontally as presses or vises for drilling, tapping, and milling on a production basis. Units are available free of charge for a 30-day inspection and trial period.

Van Products Co, 5700 Old Ridge Rd, Erie 7, Pa

DeVilbiss Catalyst Spray Gun

Designed to spray plastic resin and catalyst simultaneously, gun is claimed to be the only one manufactured which will assure a uniform mixture of both elements.

Resin is fed through the fluid line and catalyst is introduced through the air stream. Gun has a single head. When trigger is actuated, both materials meet outside of the air cap and are atomized uniformly so that correct amount is applied to surface being sprayed. Single pressure control is installed for the resin, and a double pressure control for the catalyst, which is the governing agent in setting. Dual atomizing air pressure control is also provided to insure uniform results regardless of main line pressure variation.

DeVilbiss Co, 300 Phillips Ave, Toledo 1, Ohio

Impact wrench, J-4S, has ⅜-in. bolt capacity, weighs 4¾ lb, measures 6¾ in. over-all length. Direct drive air motor gives 1800 impacts per minute; ⅝-in. square drive is standard, with optional ½-in. square drive or 7/16 in. female hex quick change chuck.

Rotor Tool Co, 26300 Lakeland Blvd, Cleveland 23, Ohio

Oil hole drills can be used either in stationary position, as in a turret lathe or screw machine, or may revolve when used in special sockets. Shank ends are either counterbored, plain, or tapped, depending on whether they are to be used with plain or threaded pipe connections. Regularly stocked with 3 sizes of pipe threads: 1/8, 1/4, 3/8 in., depending on drill diameter. Available in straight or taper shanks, in standard or extra length; made of HSS; furnished from 1/2 through 1-1/2-in. dia in increments of a 64th, in straight shank taper length type.

Chicago-Latrobe, 411 W Ontario St, Chicago 10, Ill

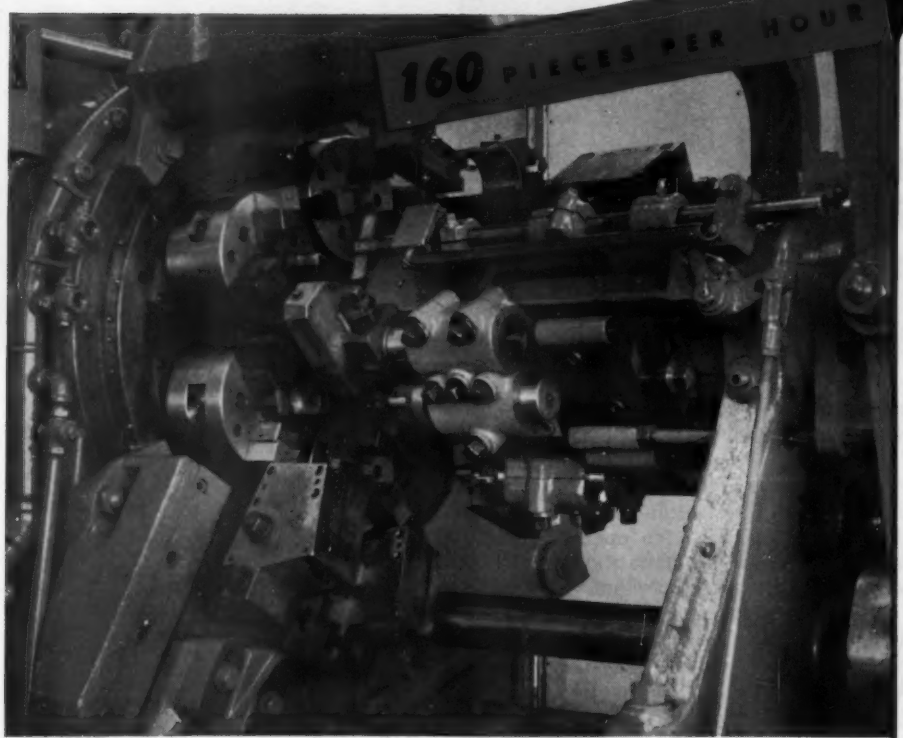
You are cordially invited to see
LATEST BAIRD MACHINES and TOOLING IN OPERATION
at the **COLISEUM MACHINERY SHOW**
Chicago Coliseum, Sept. 6-17, 1955 — **Booth 619.**

4th in a Series...

OF HIGH PRODUCTION CASE HISTORIES

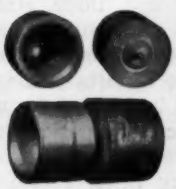
ASK BAIRD ABOUT IT

"TURN-AROUND" JOB... PRODUCES 2 HYDRAULIC LIFT PISTONS FROM EACH IRON CASTING...



FIRST PASS:

Work is placed in chuck equipped to receive the unfinished casting. Outer end is then rough-and-finish turned on OD (allowing for grinding); ends are faced; spherical seat rough-and-finish turned; centering seat chamfered and turned, and shoulder diameter turned concentric with OD. Groove cut concentric with OD.



SECOND PASS:

Work is turned around after return to loading station and placed in adjacent chuck, unfinished end out, and passed through machine for the same operations. The parts are then separated.

TOOLING: This Baird 76H Chucking Machine is arranged for single indexing with alternate chucks for rough-and-finished ends of the work, two-station live-center attachment, adjustable tool holder for use in machining three different sizes of pistons, and with alternate cycle cut-off.

If your production could benefit by up-to-the-minute, cost-saving "automation" tooling like this . . . "Ask Baird About It."

Write Dept. AM

THE BAIRD MACHINE COMPANY
STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS • AUTOMATIC [illegible] FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

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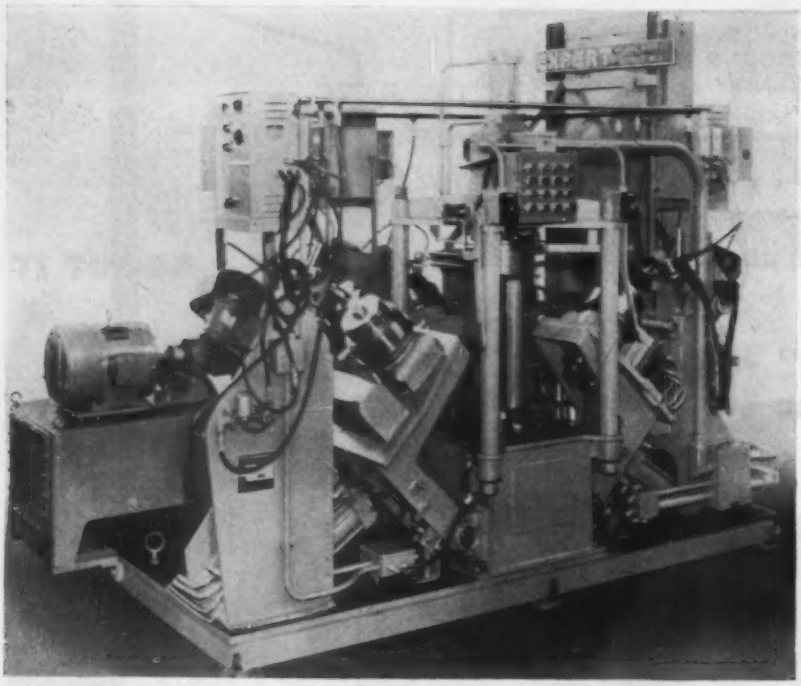


Assembly and Shielded-Arc Welding Combined in Expert Triaxial Welder

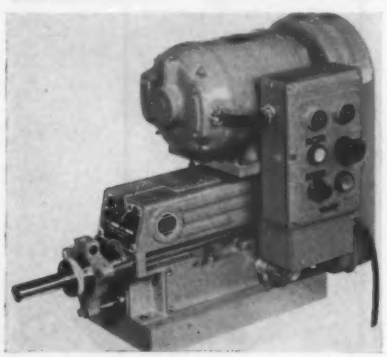
Assembly and argon shielded-arc welding operations are combined so one operator can assemble and weld two 8-in.-dia sheet-metal fluid-coupling parts at a rate of 300 finished assemblies per hour in the Expert Triaxial welder.

A special vertical hydraulic assembly press and three standard welding heads are positioned at 90° locations. Welding operation is performed on two fixtures while parts are assembled in a third fixture by the press. Three automation devices transfer fixture and assembled part to the welding head, rotate them at 90 ipm for welding, and return them to pressing position.

A separate hydraulic power pack supplies power for all control and operating functions. Separate electrical and welding control panels are provided. Individual operating buttons are provided for each fixture to facilitate setup operations. Panel lights indicate the operating condition of automation fixtures, which are separately operated.

The machine occupies a floor space about 5x10 ft, and it is 7 ft high.

Expert Welding Machine Co, 17144 Mt Elliott Ave, Detroit 12, Mich



Hydraulic Power Unit Has Locked Circuit Feed

Drillmation Model 500 is a self-contained hydraulic power unit for drilling, reaming, counterboring, spot facing, and chamfering.

Variable delivery hydraulic pump is an integral part of the spindle and quill. Hydraulic feeding thrust is applied directly behind the spindle, eliminating deflection, and designed to assure smoothness of feed on heavy operations. Locked circuit feed eliminates constant adjusting required when temperature of hydraulic oil changes, and maintains a constant preset, uniform feed cycle.

Tool is completely automatic; emergency cycle return button is provided on front, and rapid traverse is controlled by limit switches on side.

Unit is said to have unlimited reserve thrust at all spindle speeds, infinitely variable rates of traverse, positive depth and thrust control, and infinitely variable feed rate. Spindle drives may be V-belt pulley, direct motor, gear reduction, or transmission. Compact power unit, especially adapted for multiple drill applications, may be mounted in any position. Built to JIC standards, it is available in standard feed cycles, jump gap, and dwell. Drills up to ⅞-in.-dia in steel, and larger in certain types of metals, castings, and forgings. Can be supplied with a time delay at end of feeding strokes for accurate facing to depth operations. Depth control is 0.0005; max stroke of 5 in.; thrust reserve can be as much as five times requirements, according to the manufacturer.

Drillmation Co, 21509 John R, Hazel Park, Mich

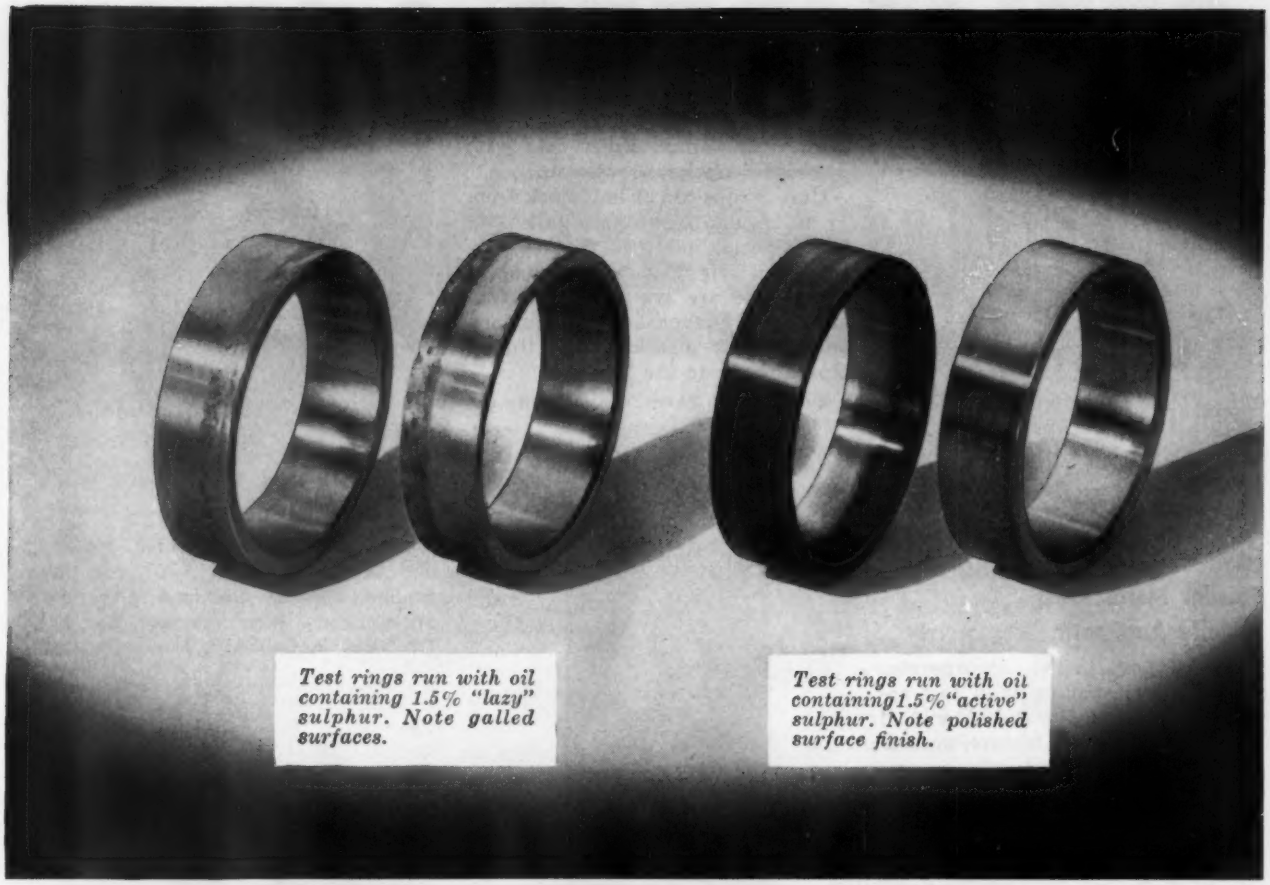
Rotating Diamond Turner Cuts Diamond Dressing Tool Cost

Mechanical rotating diamond turner for dressing grinding wheels is guaranteed, according to Wheel Dressing, Inc, to reduce diamond dressing tool cost at least 50% when used with WDI tools.

The "Turn It" rotates the diamond tool at intervals to present a new sharp cutting edge of the diamond to the wheel. Rotation eliminates excessive diamond heat and pressure, keeps facets small and sharp. In addition to longer diamond life, the increased number of facets is said to give better wheel finish, eliminate dull glazed wheels, permit closer work tolerance, and increase wheel life.

The turner has infinite adjustment, by means of a setscrew, in the range of 0 degrees to 10½ degrees to obtain from 35 to 120 facets. It is available in manual or automatically operated models; automatic model repositions diamond for dressing.

Wheel Dressing, Inc, 8720 W Chicago, Detroit 4, Mich



Test rings run with oil containing 1.5% "lazy" sulphur. Note galled surfaces.

Test rings run with oil containing 1.5% "active" sulphur. Note polished surface finish.

Only ACTIVE Sulphur Provides Fluid Lubrication Under Extreme Pressures

This comparative test proves it! Both tests were run on an SAE Lubricant Tester using two oils with the same percentage of sulphur. The specifications were similar—but look at the results!

The set of rings on the left were run with an oil containing "lazy" sulphur that did not provide the necessary anti-weld qualities. Under the heavy loads present in the test, the rings quickly galled and seized. The pair on the right were run with an oil containing "active" sulphur, the *only* type of sulphur that will prevent galling or seizure. It is performance that counts, not specifications.

"Active" sulphur in a cutting oil, readily reacts with the metal surfaces of the tool, chip and workpiece to produce metallic sulphide films that become fluid lubricants when sufficient heat is generated, and provide lubrication under the high temperatures that exist in the cutting orbit.

Stuart Oil Company's Shop Note Book, Bulletin S-2, contains further information on how to select a sulphurized cutting oil. Write for your copy today, and ask to have "the Man in the Barrel", your Stuart Representative, call too. He will help you select the cutting fluid that will provide the very best results under the conditions you will subject it to.

D.A. STUART OIL COMPANY, LTD.
2729 S. Troy St., Chicago 23, Ill.

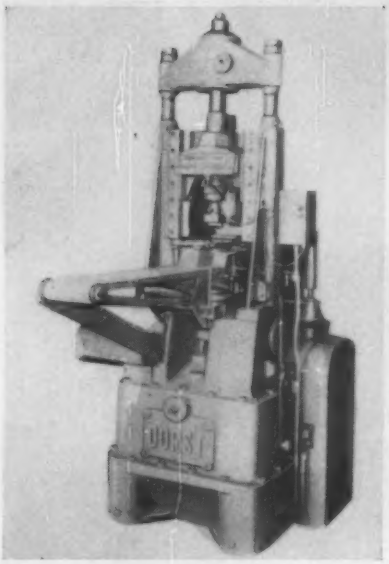
More than a "Coolant" is Needed

Stuart Oils

Time Tested Cutting Fluids and Lubricants

Plants in: Chicago, Detroit, Cleveland, Hartford, and Toronto, Ontario.

Branch Warehouses and Representatives in principal metal working centers in the United States, Canada and Europe.



Powder Metal Press Is Fully Automatic

Dorst Super model incorporates smooth toggle motion with fast approach to die cavity and slow final entry into die. This feature, according to the manufacturer, assures production of parts of flawless structure.

Device permits adjustable timing of the floating die in relation to top punch, reportedly producing parts of extremely uniform density. Hydraulic cushion combined with clear visibility pressure gage and electrical cut-out switch disengages clutch in case of overpressing. Micrometer adjustment is provided for the die fill. Pick-up mechanism lifts pieces out of die cavity and transfers them onto conveyor belt, synchronized with speed of machine.

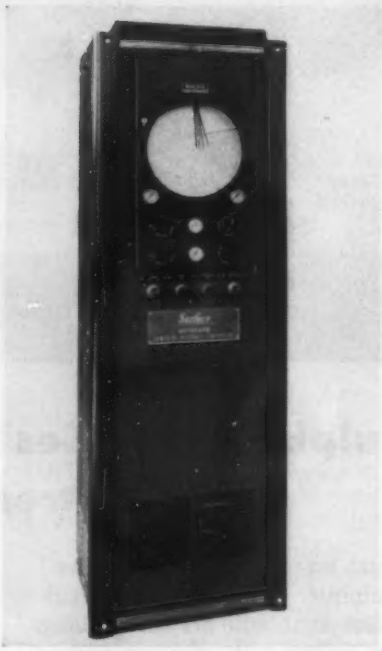
Arnhold Ceramics, Inc, 1 E 57 St, New York 22, NY

Chuck Jaws Close With Hand Wheel Pressure

Toledo Spin-Torque chuck has special rocking-wedge jaws which tighten as torque is applied. Spin of the hand wheel closes jaws quickly and smoothly; no hammering is necessary because jaws pull up tight under normal hand pressure. Diagonal serrations eliminate end thrust slippage, according to the manufacturer, and permit either clockwise or counter-clockwise rotation.

Unit clamps rod or bolt stock from ¼ in. up, and pipe or conduit ⅛ to 2 in. Special interlock feature permits handling this wide range of sizes. Jaws are set flush with face of chuck to prevent injury to fingers, and to allow pipe fitters to thread pipe directly to the face.

Toledo Pipe Threading Machine Co, 1445 Summit St, Toledo 4, Ohio



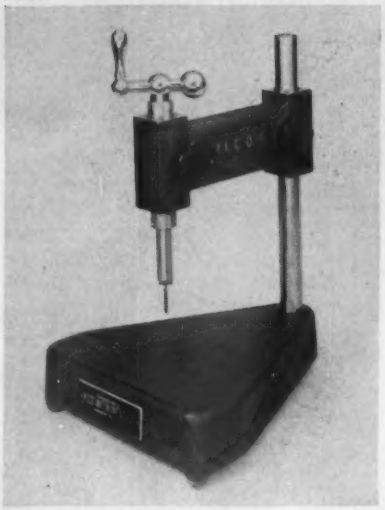
Pneumatic Autocarb

Surface Combustion has added a pneumatic recording controller to its Autocarb series.

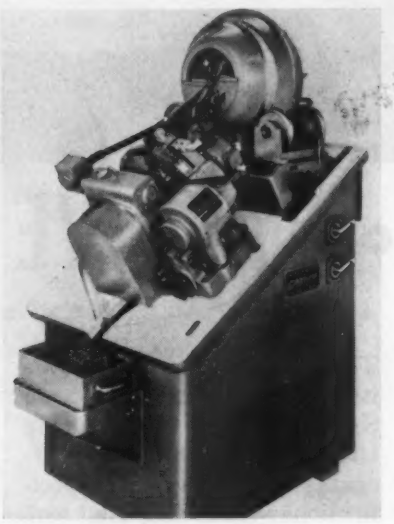
Autocarb systems automatically control the carbon potential in continuous or batch-type controlled atmosphere heat-treat furnaces. They can also be used to control the dewpoint of gas atmosphere generators.

This self-contained unit incorporates all of the features of the company's electronic automatic controller. It automatically compensates for any changes in work surface area, as well as in gas analysis, while the furnace is operating, without manual adjustment. Models are available as a dual-record instrument, for simultaneously controlling two separate processes, or as a single-record unit.

Surface Combustion Corp, Toledo 1, Ohio



HAND TAPPING MACHINE HEAD and post assembly, No. 901, can be mounted on any standard Mico engraver base — *Mico Instrument Co, 74 Trowbridge St, Cambridge, Mass*



Automatic Screw Slotter

Roy screw slotter automatically slots, deburrs, and delivers up to 720 screws per minute.

Entire range of the machine is covered by one work carrier wheel which permits changeovers to be made in minutes. Newly-designed removable hopper, said to be completely jam-proof, speeds work to the saw. Work carrier and saw, electronically controlled, have four easily set speeds from 108 to 720 screws per minute.

Additional features include automatic deburring device, frictionless bearings, and large coolant tank equipped with motorized pumping unit.

Roy Machinery & Sales, Inc, 5 New Britain Ave, Farmington, Conn

HY-PRO SPECIALIZES TAP DESIGN

DESIGNS are made to suit your specific demands by Hy-Pro engineers, who specialize in taps.

INDIVIDUAL BLUEPRINTS accompany every order followed in Hy-Pro's production line. The quality of your Hy-Pro taps is insured by this one of many specialized procedures.

...to save costs in your production

Tap design is specialized at Hy-Pro. In fact, their whole operation is concentrated on the development and production of this one important line. Toward this end, Hy-Pro's design engineers are able to center their attention on the most efficient and economical taps for the jobs you need.

Over 5000 blueprints are handled every week . . . another indication of Hy-Pro's recognition in this field as "*The Tap Specialists*".

Whatever your own tap needs may be, let Hy-Pro help you boost production. Contact your local distributor or call Hy-Pro direct. They offer you a full line of quality taps, plus the experience of specialized design engineers.

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109 Edison Pl. NEWARK 5, N. J. Market 2-4318

New Norgren Lubricators For Bearing Applications

Norgren has added five models to its line of Micro-Fog lubricators.

A 1-qt oil reservoir unit is available in ¼, ¾, and 1-in. pipe sizes with capacities to lubricate up to 32, 200, and 300 bearing inches, respectively. The 4½-gal. model is now being made in ¾ and 1-in. sizes with 200 and 300 bearing-inch ratings. The ¼-in. lubricator at rated operating pressure of 20 psi uses 2 cfm of air; the ¾-in. at 23 psi uses 5 cfm, and the 1-in. at 40 psi uses 7½ cfm.

Units operate automatically, delivering a uniform rate of feed regardless of supply of oil in reservoir. They permit a precisely controlled distribution of Micro-Fog to multiple lubrication points in simultaneous operation.

C A Norgren Co, 3436 So Elati, Englewood, Colo

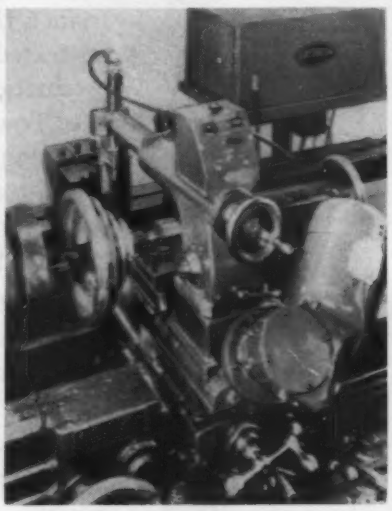
Paint Heater Units For Hot Spray Process

System, which utilizes hot water, is designed for either large or small operations.

Material to be sprayed is heated in a heat transfer unit located near the spray station. Paint reportedly cannot become overheated. Jacketed hose from the exchanger to within a few inches of the spray gun assures heated material at point of usage. Water for the system is heated in a separate unit, located wherever convenient; one water heater will handle several exchangers located at different points. Material to be sprayed can be placed in a pressure paint tank, or circulated through a circulating system. Each exchanger will heat up to 32 oz of material per minute.

Only moving part in the complete system is the axial flow, magnetic-type hot water pump, completely sealed.

DeVilbiss Co, 300 Phillips Ave, Toledo 1, Ohio



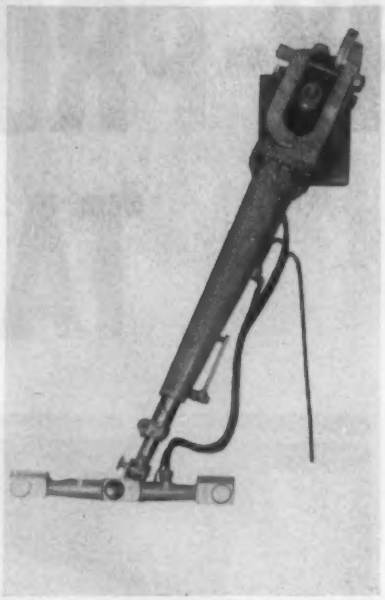
Electronic Duplicators

Automatic contour and depth of cut controls are designed for installation on either new or existing machines, and can be manually operated when desired.

Precision obtained is said to be limited only by the mechanical condition of the tool on which it is installed. Tolerances of ± 0.0015 in. can reportedly be readily and continuously maintained even on abrupt changes of contour, and without operator fatigue.

Duplicators are available as single, dual, or two-motion servo-controls, automatic in operation along one or two axes up to 360° as dictated by contour of templet. Manual controls allow operator to override servo action and relocate follower along either axis at any time. Protective relays make the system inoperative if tracing stylus tip is over-deflected.

Raytheon Manufacturing Co, Waltham 54, Mass



Adjustable Press Control Arm Reduces Operator Fatigue

Adjustable press control arm has been designed to provide a completely flexible method of positioning the run and stop buttons on presses. In addition to conserving operator time and motion, the device permits buttons to be pressed at the most convenient and safest operating position.

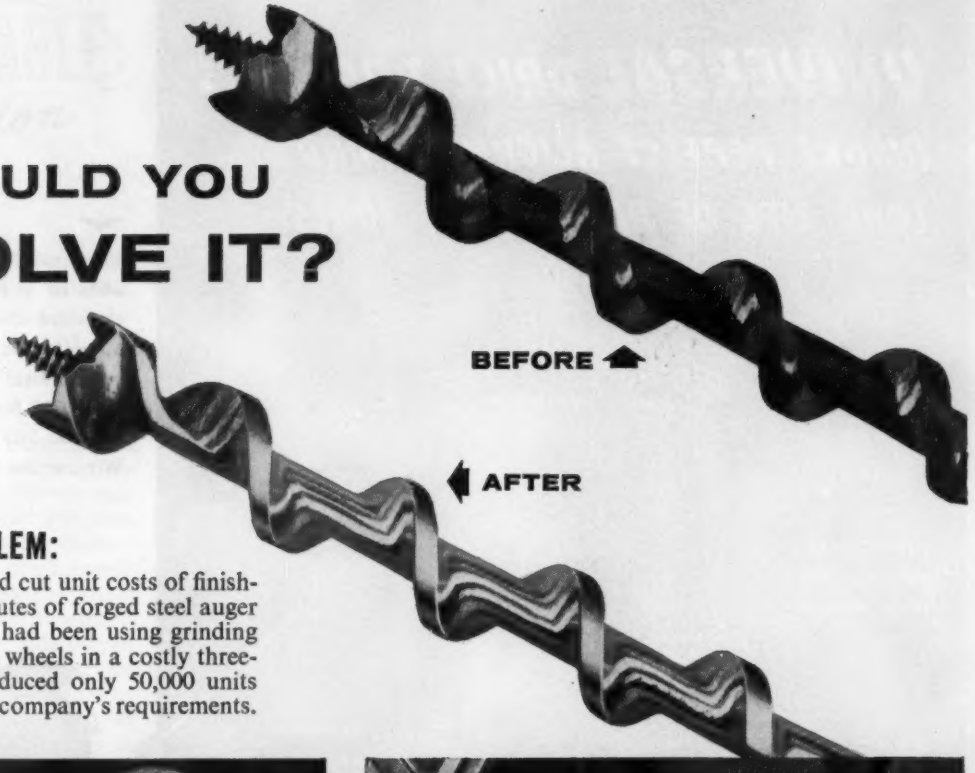
Control buttons are mounted on a bar attached to an adjustable, telescoping arm; telescoping shafts permit any desired height adjustment. Major movements front to back and left to right are made by swinging the arm to desired position on its universal ball joint connection. Although unit is permanently mounted on the press, arm can be swung completely clear of the working area when changing dies, and can be instantly relocated when production is resumed.

Danly Machine Specialties, 4258 W Roosevelt Rd, Chicago 50, Ill

Rubber-to-metal bonding process, called Permadizing, provides parts said to be entirely free of harmful flash and flaring of rubber and bonding agent on metal inserts. Dimensional tolerances of material can be as closely held as on metal parts themselves. Process has successfully bonded aluminum to varying compounds of rubber, synthetic rubber, or silicone. Parts exhibit extremely low swell, high resistance to aromatic fuels and hydraulic fluids, and can be made corrosion resistant.

Stillman Rubber Co, 5811 Marilyn Ave, Culver City, Calif

HOW WOULD YOU SOLVE IT?



1. PRODUCTION PROBLEM:

To increase production and cut unit costs of finishing crimps and grinding flutes of forged steel auger bits. Irwin Auger Bit Co. had been using grinding or hard wheels and set-up wheels in a costly three-step operation which produced only 50,000 units per week—far less than the company's requirements.

2. SOLUTION: A 3M Representative showed this Wilmington, Ohio manufacturer how the 3M Method would grind and finish forgings in just one operation using a Grit 60 Electrocut Three-M-ite Cloth Belt, and produce a smoother, more even finish than with set-up wheels.

3. RESULTS: A 50% production increase. The 3M Method boosted weekly output to over 80,000 units—cut unit costs, too. And man hours for this operation were greatly reduced. A 3M Representative can help you solve your grinding and finishing problems, too. Call him today.

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3M ABRASIVES

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Dept. AK-95, St. Paul 6, Minn.

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SUPERFINISH BORES REDUCE TOOL WEAR
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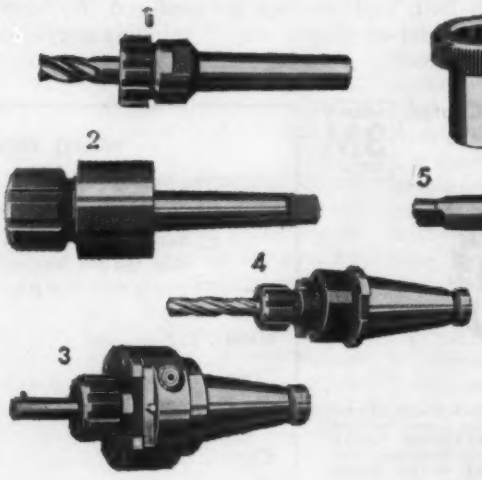


1	STANDARD COLLET CHUCK
2	FLOATING COLLET CHUCK
3	BORING CHUCK
4	"KWIK-SWITCH" TOOL HOLDER
5	MIKRO-LOK BORING BAR
6	STANDARD DRILL BUSHING
7	UNIVERSAL INDEX PLUNGER

ROUND TABLE Discussion

SICK LEAVE

Should unused sick leave days be added to a worker's vacation time? What is the best means of handling the problem of the man who takes such leave unnecessarily, and then actually does become ill?

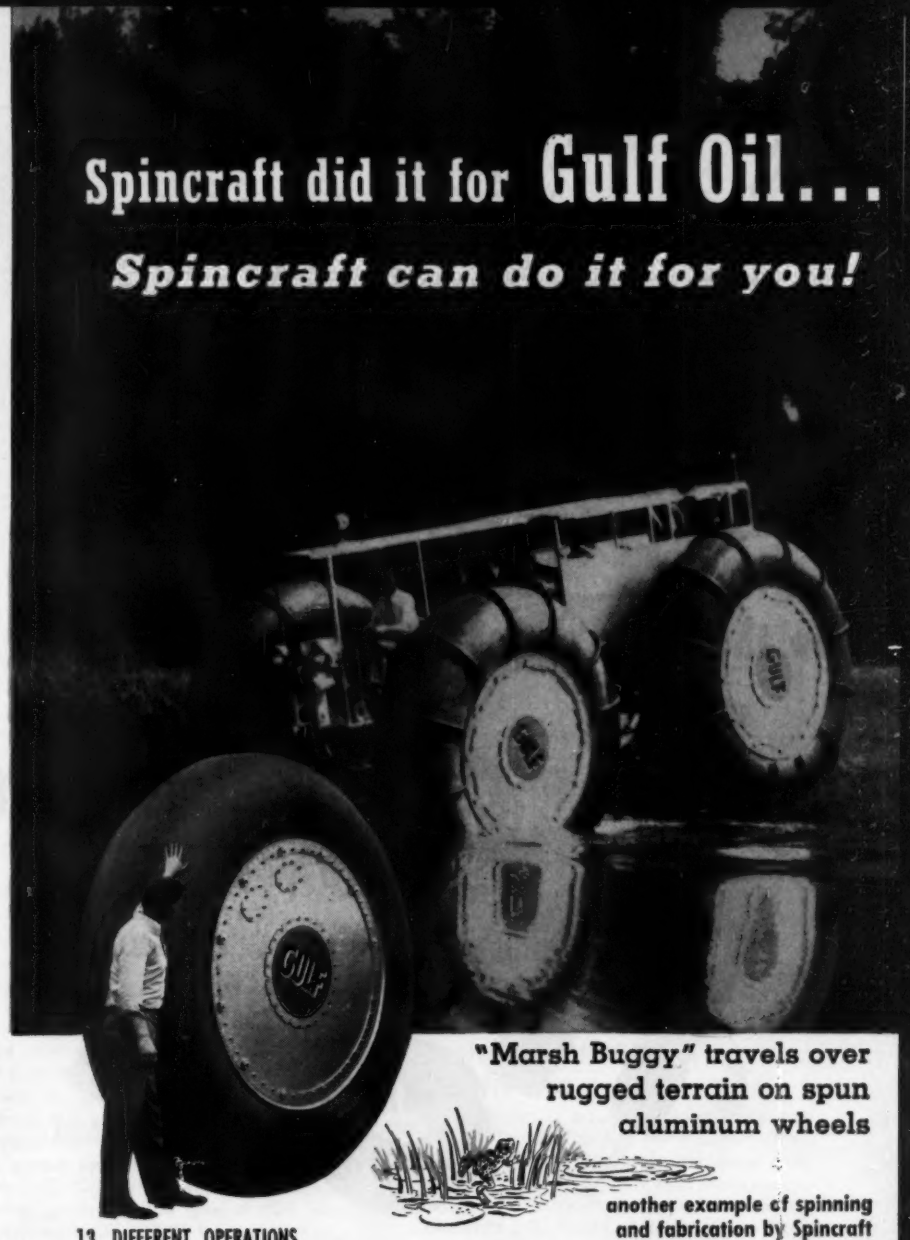
SICK LEAVE, coffee breaks, elimination of time clocks, and any other gift of management, created for the purpose of building up the employee's morale, are fine in themselves if it were not for the one disagreeable feature in many employees. Unfortunately there are those who do not shoot square in their dealings with others. There are some who wouldn't even bat an eye were they to hock their mothers' false teeth for a couple of bucks. It is this class alone that makes the running of such things as sick leave very difficult. They take advantage of that which was originally conceived to assist them at a time of great need.

When I was hired for my present job I was informed that I was allowed five days of sick leave with pay. I naturally figured that I would have to be physically indisposed and not be able to continue on with my work in order to be considered as being sick. I soon overheard such things as: "I've got three days coming to me; I think I'll go fishing for a couple of days—what the hell; I've got it coming to me." The question is a moral one. Has he? He had his good time fishing, and following his return to work he developed a very bad case of flu as a result of wet feet and exposure, or possibly

"We've decided to carry out a few of your little suggestions."

Spincraft did it for Gulf Oil...

Spincraft can do it for you!

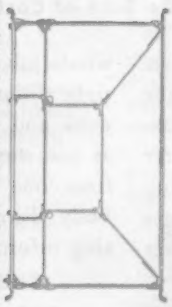


"Marsh Buggy" travels over rugged terrain on spun aluminum wheels

another example of spinning and fabrication by Spincraft

13 DIFFERENT OPERATIONS

The "Marsh Buggy" rolls on sturdy, lightweight aluminum wheels — spun and fabricated by Spincraft. Even if all four balloon tires fail, the spun aluminum air-tight wheel drums will keep the vehicle afloat. Wheel flange segments, extensions, .118" thick 52SO aluminum stiffener ribs, No. 11 U. S. gauge (.125" thick) stainless steel front hub cones were machined and assembled to complete the wheels. In addition to spinning, Spincraft performed the following operations: welding, grinding, polishing, machining, punching, braking, drilling, tapping, sawing, riveting, assembly and testing.



Write for Spincraft data book. If you have a specific problem, tell us about it — no obligation.

WHEN Gulf Research & Development Co., a division of Gulf Oil Corp., contracted to build their world-famous "Marsh Buggy" for the U. S. Army, Gulf called on Spincraft to fabricate all four wheel assemblies.

These huge wheels are designed to bear loads of 1,500 to 4,000 lbs. Combining strength with lightweight, these tough aluminum alloy wheels can take grueling cross-country punishment. The 10-ft. dia. tires easily negotiate swamp, water, sand, deep mire and other difficult terrain, at speeds from ¼ to 40 miles per hour.

This is another example of Spincraft's versatility and manufacturing skill. Complete facilities are available for all types of contract manufacture — finished parts, assemblies and complete products. Take advantage of our modern tools for spinning and fabricating. They can pay off in savings for you, too.

WORKSHOP OF AMERICAN INDUSTRY SINCE 1919

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Spincraft

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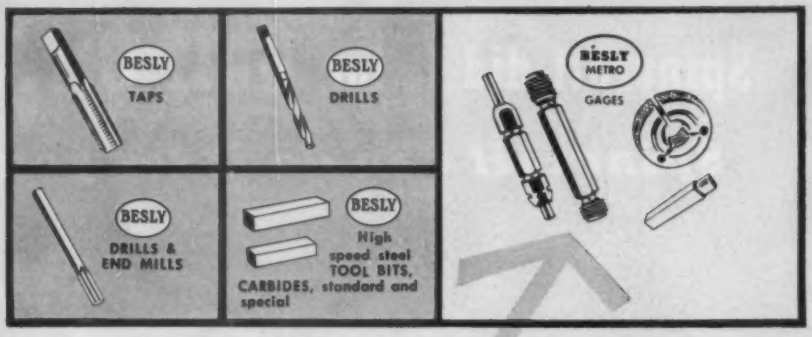


New Additions to the BESLY cutting tool line

BESLY METRO GAGES

BESLY METRO STANDARD and SPECIAL CARBIDE TIPPED TOOLS

Now You Can Get Precision Gages and Carbide Tipped Tools from Besly—and Be Sure of Cost-Cutting Quality

To serve you better, Besly has recently purchased the assets of the Metro Tool and Gage Co. of Chicago, for 15 years a manufacturer with a reputation for outstanding quality, supplying precision gages and carbide tipped tools. This makes the Besly Cutting Tool Line even more complete, enabling you to get a wider selection of Besly *Quality* Cutting Tools that mean longer life and greater accuracy in your shop. A broader Besly selection gives you the advantage of one quality source responsible for all the elements of your machining operations. The net result is *lower final costs* for you as Besly can furnish tools and gages for the whole job, from drilling or turning right through to final gaging. Paper work and purchasing are simplified as you now can buy all your tools from one proven source. See your Besly distributor or write for catalog information.

BESLY

BESLY-WELLES CORPORATION

Established in 1875 as Chas. H. Besly & Co.

120 Dearborn Avenue

Beloit, Wisconsin

falling into a stream, with the result that he overshot his five days by four more. Result—loss of a large chunk from his pay check. He griped about having a hell of a time of it making ends meet and blamed his plight on his employer.

It so happened, shortly after I started work, that I had to undergo a minor operation which soon used up my five days, leaving me none for the remainder of the year. I appreciated having had the five days allowance. The thought came to me at the time that wouldn't it be fine if sick allowance could be made to cover greater emergencies such as operations and injuries. I couldn't help it because I had to have a slight trimming of my anatomy whereas Raymond, the fisherman, brought it upon himself by his selfishness. Doesn't seem fair, does it?

Harry Musclebound, a perfect speciman of humanity, was so healthy that he didn't even have to sneeze if his nose itched. The five days are his, if he ever has an occasion to need them, but he takes the attitude that it is unfair to him, because he has the blessings of sound health, for others to get the benefit of the five days because of illness. He blames his Creator for making him so healthy and gripes about being unable to collect! Funny world. Old Muscles didn't fish or he didn't hunt; he just worked along grumbling about his misfortune of being in a good state of health. You can't win, Mr Employer; you're stuck with colorful members of the human race.

Tom Rowbottom called up to inform his boss that he didn't feel like coming in to work. He didn't tell the man that he felt more like going hunting for the day, so he just went hunting. He wasn't outwardly dishonest; he was just taking advantage of a situation that had loopholes

"Stop telling Henry jokes when he's burning!"

in it. Sick leave is sick leave, and as such, the worker should be paid for the five days he is out with sickness. Taking advantage of this could result in the company putting its foot down and eliminating the sick leave altogether. Far better than have conditions as they are would be to have an understanding that five days be allowed each year for the employees to do with as they see fit —stay home if they are sick, fish or hunt if they want to, or go on a rousing binge for a couple of days. In this the temptation to cheat would be eliminated at least.

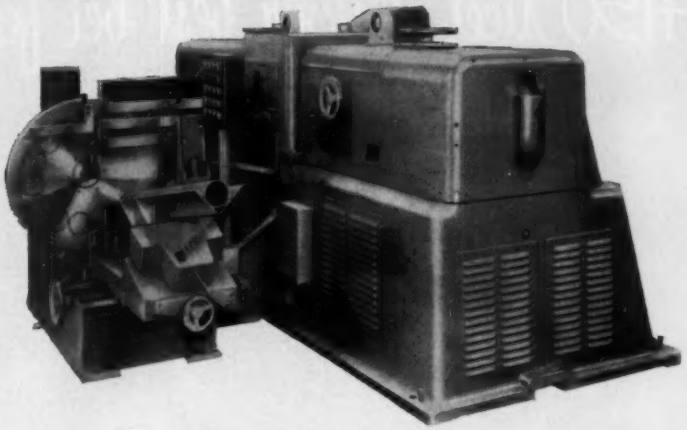
Recently a newcomer informed me that over at the Screwball Surface Plate Company they allowed their workers five days of sick-leave for the year, and, if at the end of the year, they hadn't used up all their time the remainder was given to them in the form of a check. While this scheme removes the temptation to cheat and eliminates the usual griping by some, it tends to make one stay on his feet when he should be in bed under medical care. This makes the empolyee money-mad in that he looks forward to cashing in on it at the end of the year. The only way to prevent this disregard for one's welfare is to have the employee go through a rigid examination by a competent person in order to prevent him from exposing the other members of the working force. It looks as though this sucker game has the employer in a corner with no way of painting himself out unless we can conceive of some means of relieving him.

Try this on your reasoning piano and see what kind of a remedial tone it gives forth: Allow each employee the usual five days—I feel that this should be extended to eight or ten—and have the unused portion of the man's time put into a sinking fund to be used by him sometime when, in the future, he is really sunk with serious illness or accidental tragedy so popular today. This sinking fund would be available to all and at the end of an employee's service he would receive a percentage of the amount given to his credit. Here you have a scheme that has all the merits of the ideal five-day plans plus that which eliminates all the other objectionable features.

Frank Van Horn
Auburn, Calif

SICK LEAVE

I AM A TOOLMAKER employed by a New York manufacturer, and I am quite close to the problems discussed by our friends Ed and Al. The in-



400 AUTOMOTIVE PISTON RINGS per minute are ground within .0002" tolerances on this new Besly Model 240 Double Horizontal Spindle Grinder. Electro-magnetic rotary pick-off disc at left automatically delivers piston rings in continuous flow between abrasive discs.

BESLY Announces New High Precision, High Production Grinder

Grinds parallel surfaces within .0002" at rates as high as 400 units per minute

The new model No. 240 Besly Double Horizontal Spindle Grinder was developed to meet today's increasing demands for greater accuracy and higher production. Grinding the parallel faces of piston rings is a natural job for the No. 240 Grinder. Automotive rings are being ground at the rate of 400 pieces per minute to .0002" for parallelism.

New in Design

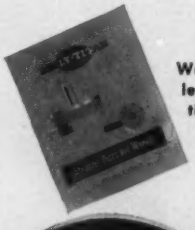
The Model 240 is an entirely new development in the Besly line of precision grinders. New features include automatic controls which are accessible from either side of the grinder. Even dressing each disc with its own separate dresser is push-button controlled. All controls, motors, starters and hydraulic units are enclosed within the rugged machine base.

Sealed Spindle Quill Construction

The grinder is equipped with Besly exclusive Sealed Spindle Quill construction which replaces old-fashioned ways with their problems of wear and inaccuracy. Quill construction also permits smooth, accurate adjustment of the abrasive discs and avoids transmitting motor vibration to the grinding spindle.

Fast Feed

High speed feeding is achieved through a simple electromagnetic pick-off disc which supplies work to the grinder in a continuous stream. Design of the machine has cut down-time for dressing, disc changing and set-up to one third of that required by other grinders.



NEW BULLETIN

Write for free copy of Bulletin 200 with description of complete Besly line of Double Horizontal Disc Grinders including the new 240.

BESLY-TITAN "Job-Fitted" ABRASIVES CAN CUT YOUR COSTS

Besly-Titan Discs and Wheels are custom-made for each job. This costs you no more, but gives more production and longer abrasive life. Write for new Abrasives Catalog.

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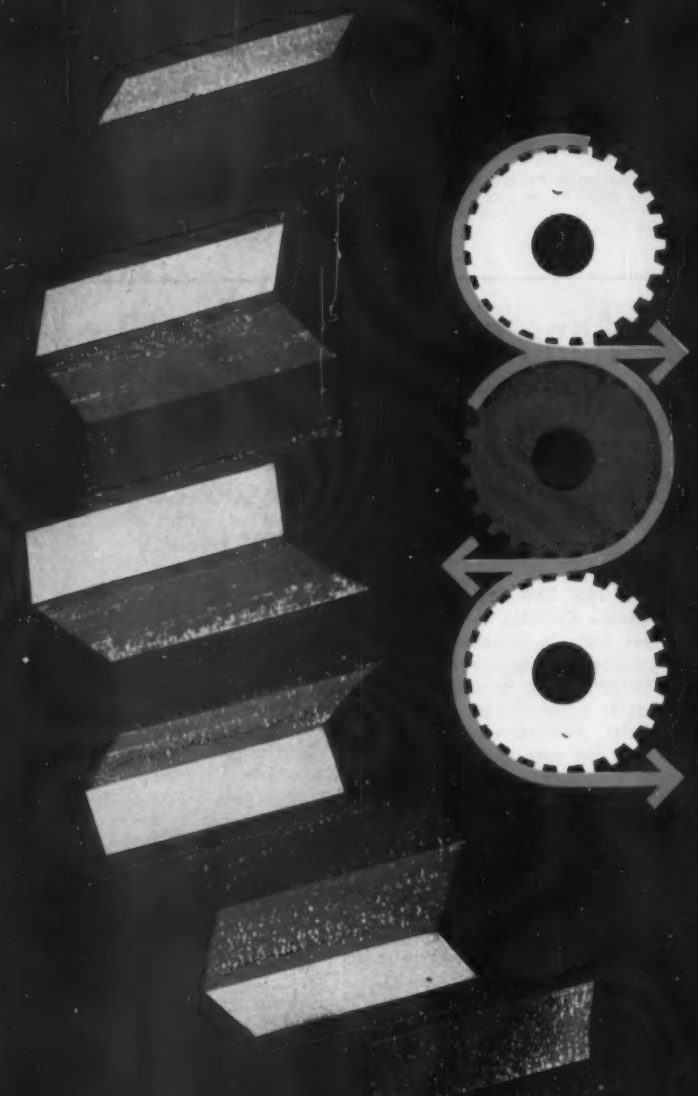
Established in 1875 as Charles H. Besly & Co.

120 DEARBORN AVENUE, BELOIT, WISCONSIN

Besly Grinders and Accessories • Besly Taps, Drills, Reamers, End Mills • Besly-Titan Abrasive Wheels

4150 steel is your best bet for heavy sections



Chromium Molybdenum Steel like AISI-SAE 4150 is the most economical way to uniform properties throughout heavy sections. For heavy duty gears — for shafts — wherever toughness and fatigue strength are important, *plentiful* 4100 Moly steels are better. We will prove it. Climax Molybdenum Company, 500 Fifth Ave., New York 36, N. Y.

AISI-SAE 4150

C 0.48/0.53	Mn 0.75/1.00	Pmax 0.040	Smax 0.040
Si 0.20/0.35	Cr 0.80/1.10	Mo 0.15/0.25	

4100 steels are your best bet

CLIMAX MOLYBDENUM

MS5-13

formative material, upon which I based my views, was obtained by soliciting the opinion of a large number of machine-shop employees on the subject of administering sick leave.

It would be fortunate indeed if one were able to introduce a common denominator to the recurring problems of sick leave. It may prove a bit difficult to adopt a mutually agreeable program. An attempt to establish a working arrangement of policing sick leave, however, harbors all the potentialities of a shaken-up bottle of soda pop. Improper handling is likely to free a deluge of ill-feeling and unconcealed antagonism.

An off-the-cuff quiz conducted among shop employees indicates a well-defined opinion with regard to sick leave. The choice of 1) sick leave without compensation for the unused quota, or 2) sick leave with compensation for the unused quota, put the spotlight on the latter. The results showed 88% in favor of compensation for sick days not used; 12% did not care. Characteristically these 12% represent, in part, the unstable element normal to the machine shop.

When speaking of sick leave on the take-it-or-leave-it basis, it would be wise to observe that an agreement of this kind between management and employees has a tendency to breed dishonesty and a brand of loyalty that is only skin-deep.

There is the case of Joe and Herb. They are both machinists and are both considered loyal to their company. One day Joe had to attend to some urgent private business. He knew that he could stay home and

"Those vitamin pills certainly give a guy pep!"

here are **10** "reasons why"

you'll be interested in **DI-ACRO* ROLLERS**

1. Cam actuated idler roll—an exclusive feature—makes it possible to form circles of small diameter in one operation.
2. Larger circles are formed in two operations. No limit to maximum forming radius.
3. Bends are located at any point in metal—with straight sections on both sides of the bend.
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di-acro PRECISION METALWORKING MACHINES

ON THESE PAGES — THE ANSWER

NAME CAPACITY—STYLE—NUMBER OF SPINDLES

"BUFFALO" RPMster — ANSWER TO THE PRODUCTION MAN'S DREAM

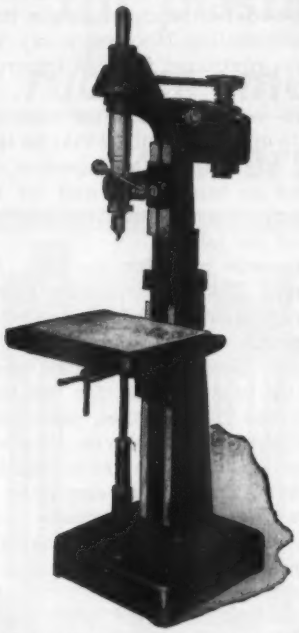
For the shop that demands the finest, this popular machine offers "everything"—INSTANT SPINDLE SPEED SELECTION without shutting off the motor—back gearing—all-geared power feed — the famous "Buffalo" precision ball bearing spindle—easy action table raising screws with hand scraped ways. Check these and other practical features in BULLETIN 3257A, your copy on request. Here's a machine typical of the "Q" Factor* value you get when you specify "Buffalo".

BELOW: handle on left gives instant speed selection — handle on right shifts into back gear, on the RPMster.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

TO YOUR DRILLING PROBLEM

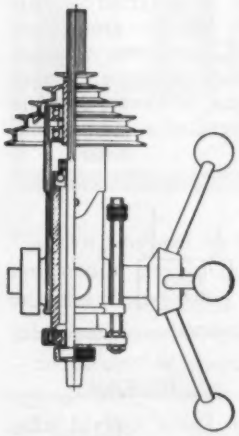
—SPECIAL FEATURES—"BUFFALO" BUILDS IT!



FOR DRILLING PRECISION PARTS the "Buffalo" high-speed No. 14 Drill handles from ⅜" down to the smallest commercial size drills. Bench or pedestal models, one to six spindles. WRITE FOR BULLETIN 2730G.

SENSITIVE OR POWER FEED; 8", 12" or 15" overhangs; models up to 6 spindles with coolant system—the ⅞" capacity No. 16 "Buffalo" Drill is a best buy in its size. WRITE FOR BULLETIN 2730G.

PRODUCTION FAVORITE! The husky 1" capacity No. 18 Drill offers 19 models. Choice of number of spindles, floor, pedestal and bench models to meet the most particular requirements. WRITE FOR BULLETIN 3123.



LASTING ACCURACY, EASY OPERATION! The "Buffalo" spindle is turned, ground and polished of high grade steel; turns smoothly and without end-play on precision ball bearings. Its six splines are fitted so accurately to the broached pulley that up-and-down motion is almost effortless.

ALL-AROUND RUGGED ½" DRILL — the "Buffalo" No. 15 is available in a very wide choice of arrangements, attachments. Single or multiple heads. A true production tool. WRITE FOR BULLETIN 2963G.

EASY HANDLING BIG-JOB DRILL — the 2" capacity No. 22 Drill stands 96" high, yet handles as easily as smaller, sensitive drills. Available with power feed. One to four spindles, round column or pedestal. BULLETIN 2989G.

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Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

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ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

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WENDT-SONIS CARBIDE TOOLS

Wendt-Sonis carbide tipped tools are *"Best in the long run."* Best, because they give you smoother finishes . . . allow faster feeds and speeds . . . and require less sharpening.

These cost-reducing advantages are built into all Wendt-Sonis tools. Wendt-Sonis selects the highest quality materials . . . assembles them to give you the finest tools available. For example, Wendt-Sonis carbide is quality controlled for absolute uniformity. Carbide is brazed to the tool bodies by the exclusive Wendt-Sonis "slow braze" process to insure a strong bond.

The complete line of high quality Wendt-Sonis carbide tipped tools, blanks and inserts are available at your local industrial distributor. Buy through him. His personal interest in your needs, plus his nearby location and training will mean savings for you.

Write Dept. AM-955 for catalogs and the name of the nearest distributor.

WENDT-SONIS
Hannibal, Missouri • Rogers, Arkansas

report sick, get paid for the day and —get away with it. He knew that the job running in his machine was of utmost importance as it had a deadline to meet.

Joe made the decision. He stated his intentions two days in advance. It allowed the foreman ample time for rescheduling. Needless to say, the job was continued without interruption.

Herb was in a similar position. Private matters required that he take a day off. Unlike Joe, however, he decided to report sick and let the company worry over the continuance of his job.

Herb was paid for the day, Joe was not. This amounts to a rather awkward paradox: It pays to be dishonest.

A job abandoned in this fashion adds up to a net loss for the company: one day's wages, productive capacity of one employee, time and money involved in re-scheduling. The honest and loyal employee, in contrast, permits the company to resume where he left off, and this without excessive and costly loss of time.

A controlling factor, with regard to this practice, may be introduced by allowing for payment of the sick days that were not used. It would logically provide that a day used for suitable reasons other than illness, may be drawn against the agreed quota.

To deny that a program of this kind can give rise to greediness, would mean to ignore the variable in the individual's character. It may be safe to assume, however, that the incidence of greediness among ma-

"Well, maybe you'd rather we sweep up the parts after we test this latest model of yours . . ."

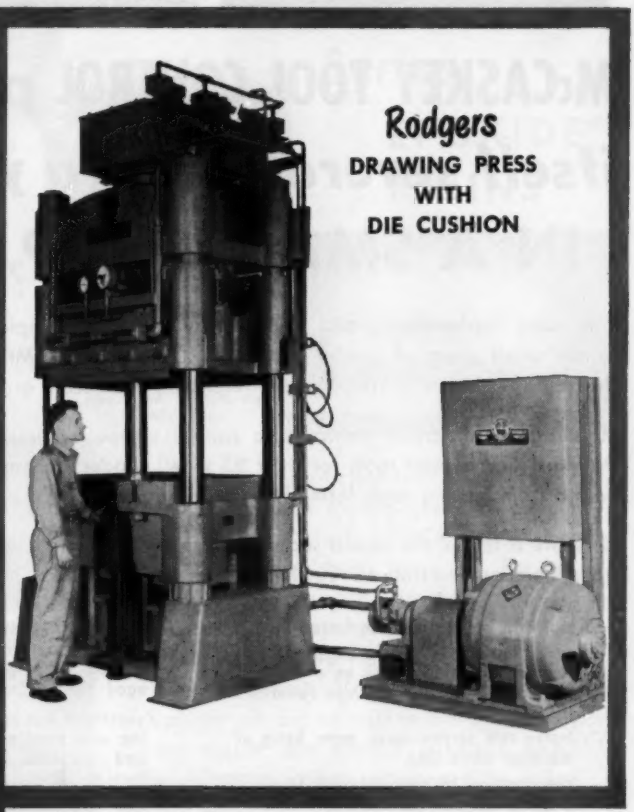
MOLD • DRAW • FORM - *FASTER!*

for plastics • rubber • metal • veneers

TWO NEW platen press models have just been added to the Blue Ribbon Line of industrial presses manufactured by Rodgers Hydraulic, Inc. The new presses—one an up-acting, the other down-acting—are available in a range of capacities and platen sizes. These new models, like all Rodgers Platen Presses, are designed to offer you greatest versatility and reliability at faster cycling rates. Investigate the application of these presses to your plastic and rubber molding, metal drawing and forming, veneering, and general assembly and utility applications.

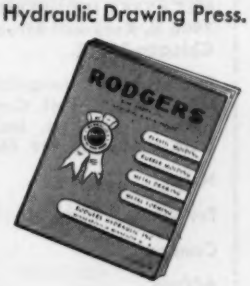
This new Rodgers Hydraulic Up-acting Platen Press is designed to meet *all* requirements of your plastic, rubber or metal forming jobs.

This press has a 100-ton capacity and 30" x 30" platens —an adjustable ejector accessory unit speeds up the cycling rate. Other Rodgers accessory units adapt this press to your every need. Automatic electro-hydraulic control system governs platen pressure, movement and cycling on production runs of any length.



New 400-ton, 48" x 36" drawing press is equipped with 70-ton die cushion, die mounting and bolster plate. Auxiliary cylinders provide fast lowering and retraction of platen—a big time saver!

The press uses the complete Rodgers electro-hydraulic system to control platen movement, platen pressure, and time cycles for short as well as long run production jobs. You'll increase quality and boost production rates of your metal drawn products by using this new Rodgers Hydraulic Drawing Press.



IF YOU'RE PROCESSING METALS AND PLASTICS you'll be interested in these presses; let us send you more information and also a copy of our catalog describing other Rodgers "Blue Ribbon Presses" for plastic and rubber molding, metal drawing and metal forming.

HYDRAULICS Rodgers KEEP THE WORLD MOVING

Rodgers Hydraulic Inc.

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McCASKEY TOOL CONTROL *pays for itself several times a year....* IN A SMALL SHOP, TOO

The many improvements and savings resulting from complete control of tools in the small plant of Lawler Automatic Controls, Inc., Mt. Vernon, N.Y. are described by James Lawler, Jr., Vice-President, in a recent article.

Manufacture of Lawler thermostatic control valves requires a wide variety of standard and special tools for their 35 to 40 production employees. Production delays from missing tools formerly were frequent and tool expense was high.

Here are a few of the results secured with their simple McCaskey Tool Crib Control system, quoted from Mr. Lawler's statements:

. . . tool crib service is much faster

. . . quick location of tools on production floor or in the crib saves an average of two hours a day of a machine operator's time.

. . . faster crib service saves many hours of machine down-time.

. . . time required by crib attendant to check tools in and out reduced 70 to 75%.

. . . tool costs have been reduced from 35 to 50%.

. . . breakage records make employees more careful about tool use and abuse and provide for quick replacement of damaged tools.

. . . guesswork has been taken out of ordering and stocking tools through simple and accurate inventory and activity records.

. . . tool hoarding and loss have been reduced, disputes between crib attendant and machine operators are prevented.

. . . the installation paid for itself several times over the first year and continues to be a profitable investment.

Let us send you Mr. Lawler's article and complete facts on McCaskey Tool Crib Control showing how you can have similar results in your plant, large or small.

Victor Adding Machine Co.
McCASKEY INDUSTRIAL DIVISION
3900 N. Rockwell Street
Chicago 18, Ill.

Please send me the article describing use of McCaskey Tool Control by Lawler Automatic Controls, Inc. and complete facts concerning the McCaskey system.

Name.....

Position.....

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AM-9-12-55

McCaskey
INDUSTRIAL CONTROLS
TOOLS - PRODUCTION - COSTS
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Victor Adding Machine Co.,
McCASKEY INDUSTRIAL DIVISION
3900 N. Rockwell Street, Chicago 18, Ill.
Galt, Ontario, Canada

chinists does not exceed that of ordinary mortals.

Should apparent greed become the reason for an unfavorable decision? Greediness, when evaluated on an individual basis, quite often turns out to be the end-product of an unspoiled sense of loyalty. There is Harry, a machinist, who insists on reporting for work, oblivious of miserable and infectious colds. Harry is quite conscious of the importance of his job. He feels that the shop may not be able to carry on efficiently in his absence.

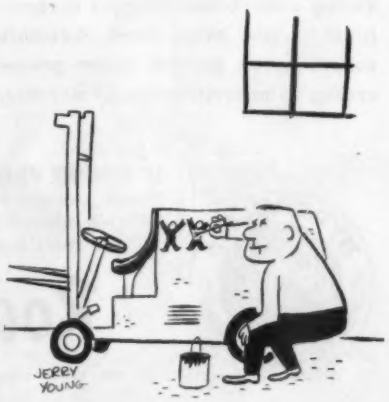
Now, were one to consider a sick-leave agreement with no provisions for unused - quota compensation, Harry would be adjudged insane by his fellow workers, or find himself labeled an old fool obsessed with a false and old-fashioned sense of loyalty.

This same Harry, however, will hear himself branded a greedy and insatiable moneybag, should the agreement provide for payment for days not used. Nevertheless, it will not alter the fact that Harry and many of his kind are guided by intentions that are, in both instances, honorable and highly commendable.

Were one to chose between greed or dishonesty, then greed is decidedly the lesser evil. It could perhaps forestall the attitude of the employee who casually remarks to his colleague at quitting time: "Well, if tomorrow is a nice day, I'm going to have stomach trouble." This merely because he has three sick days left, and "anybody who does not take them is a blasted fool."

Paul N Siebenaler
Brooklyn, NY

SINCE OUR many social benefits have come into being in our industrial world we have created many new problems. The sick leave is a wonderful step forward in social reform making it possible for a worker to



be sick and yet collect his pay while out of work. Those who thought up the idea were working to make the laborer become one of a "better class of people." However, along with this idea there was no counterpart or control developed for application of the new reform.

Naturally this sick-leave idea caught on. Why wouldn't it? Here was a new way to raise the level of the ordinary worker at the expense of the business man. Further, it did have some real merit, if properly administered, for the industrialist. No one worried about many problems arising from it, much less the avid promoter of the idea. So sick leave was born.

Now there are many who like to get something for nothing—who like to beat the company, and who believe that the world owes them a living. Fortunately this is not the majority group in any instance, but it is a group large enough to create problems. Suddenly a wonderplan of giving a man five days each year with pay, in which he can be sick, backfired—Why?

Who can control sickness? Why five days? What happens if the man were not sick? Many questions arose and many were invented and asked —the more talk—the more many people began to feel they were getting gypped each year out of five days' pay.

So the more bold began to scheme up a way to beat the idea. Why not just stay home and collect the money without being sick? They tried it, and sure enough—because no check was made—the stunt worked. Who was to blame? Both parties, but perhaps mostly the company, because they did not set up a control on this new idea. They knew that men would take advantage of anything proposed. It is human nature to some, and it is not confined to the lower working class.

So, as in all things, the constant beating of the plan caused it to become more and more just a way to get five days extra, days without work. Now, eventually the idea got so bad that even the Civil Service had to place controls on the working of the idea. When this happens—things really are bad.

The easiest control was to require a doctor's statement of sickness. This reduced the stay-out to a minimum.

Now either those who take advantage of the plan are sick, or they have an "in" with some doctor who is willing to sign a statement for a cut. Again, fortunately, these individuals are few and far between.

As in all laws nothing can be es-

GOODYEAR AIRCRAFT

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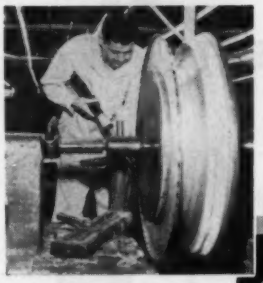
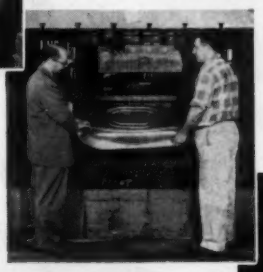
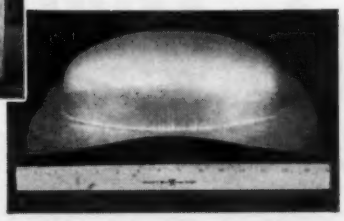


Cast spinning chuck for spinning aluminum.



.051" thick 51S type aluminum being formed on plastic die which was cast.



.051" thick stainless steel part drawn on plastic die.

Cast plastic hand-forming assembly block.

Plaster mold used for casting of plastic.

Tool being cast into plaster mold.

Material and fabrication time are the major considerations in tooling costs. Goodyear saves 50 to 75% with HYSOL 6000 Series tooling plastics! Here's how: . . . Per volume costs are cheaper than metal. Fabrication time and expense are also cut . . . tools are produced faster and with no increase in personnel or capital investment. A plastic die can be cast or laid up directly from master die models without hand barbering or fitting, requiring little skilled labor and no expensive machinery. Time is slashed, and a tool can be completed and in use within a few days. HYSOL produces more tools per dollar than any other method and eliminates large stocks of various sizes of steel and all metal waste.

Plastic tooling may solve your problems. HYSOL plastics are useful in a variety of molding, casting, laminating, and allied applicatcns. Our research, design, and production departments are ready to serve you. Write, wire or phone.

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houghton laboratories, inc.

OLEAN, NEW YORK

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tablished to run wild without some curbs placed upon it. Sometimes these curbs are actually hardships on some people. Let's think for a moment. Why should a person legitimately sick with a cold have to pay a doctor to sign a statement that he was ill and had to stay home? We see now that the plan to help the lower class actually benefits the doctors—for their house-call fees are such that it really absorbs a good portion of the worker's pay for the day out.

Actually we should spend more time in working out details of social reforms and less time in dreaming up new ones. If your sick-leave plan is not being abused by a great many, then don't try to control it. If a large group start staying home just to collect, then require a doctor's statement of illness.

Charles D Townsend
West Hartford, Conn

THE COMPANY has just got to face the facts on this problem of sick leave. They can go to one extreme and allow the employees a predetermined number of sick leave days off per year which they can take, sick or not. They can go to the other extreme and attempt to rigidly control the use of sick leave.

When they take the first approach it becomes very simple for the supervisors; in fact, with such an arrangement it is possible for the employees to tell the supervisor just when they plan to take their sick-leave time off, except of course when they are ill. This is a practical approach, and is equitable and fair to

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BEFORE you go to the time and expense of getting a custom-made holder for a welding job, take a look at the variety of standard Mallory Electrode Holders. You can probably pick out the design your application requires ... at substantial savings in cost and delivery.

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In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario

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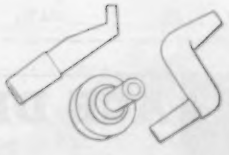
STANDARD ELECTRODES

Odd-shaped electrodes you consider "specials" may well be standard items for Mallory ... can be made quickly with existing tools, in a wide range of single-bend, double-bend and irregular shapes.



For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

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ADRIAN, MICHIGAN
ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

all the employees because they all get the same number of days off.

When the organization tries to keep strict control of sick leave, it leads to all sorts of problems. Employees are required to obtain a letter from a doctor as proof that they were ill enough to require medical attention. There are companies that engage visiting nurses to call at the homes of employees to make certain that they are ill and that they remain at home. Most organizations take an attitude somewhere between these two extremes. In general, they do not sanction the employees taking time off if they are not actually sick. However they realize full well the difficulties attached to rigidly policing such a regulation. Instead, they require compliance with some simple requirements to prevent flagrant abuses. The usual requirement is that the employee telephone his superior or foreman before a certain time each morning when he is out sick.

I have worked in quite a number of shops, both big and small, and I believe that this last method of control is both practical and equitable for both employer and employee.

William Martin
Brooklyn, NY

ONCE A COMPANY inaugurates a policy of granting sick-leave pay to the employees, they must expect to face the problems attached to this policy. The problems are many, and can create a great deal of internal friction within the managing group and between management and the employees. The nature of these problems is such that they are foreseeable, and firm policy regarding each

"I filled it with milk, just like you said, two weeks ago."

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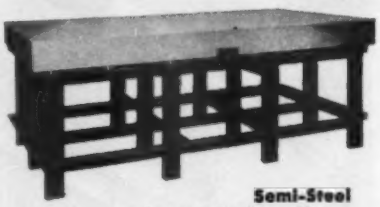

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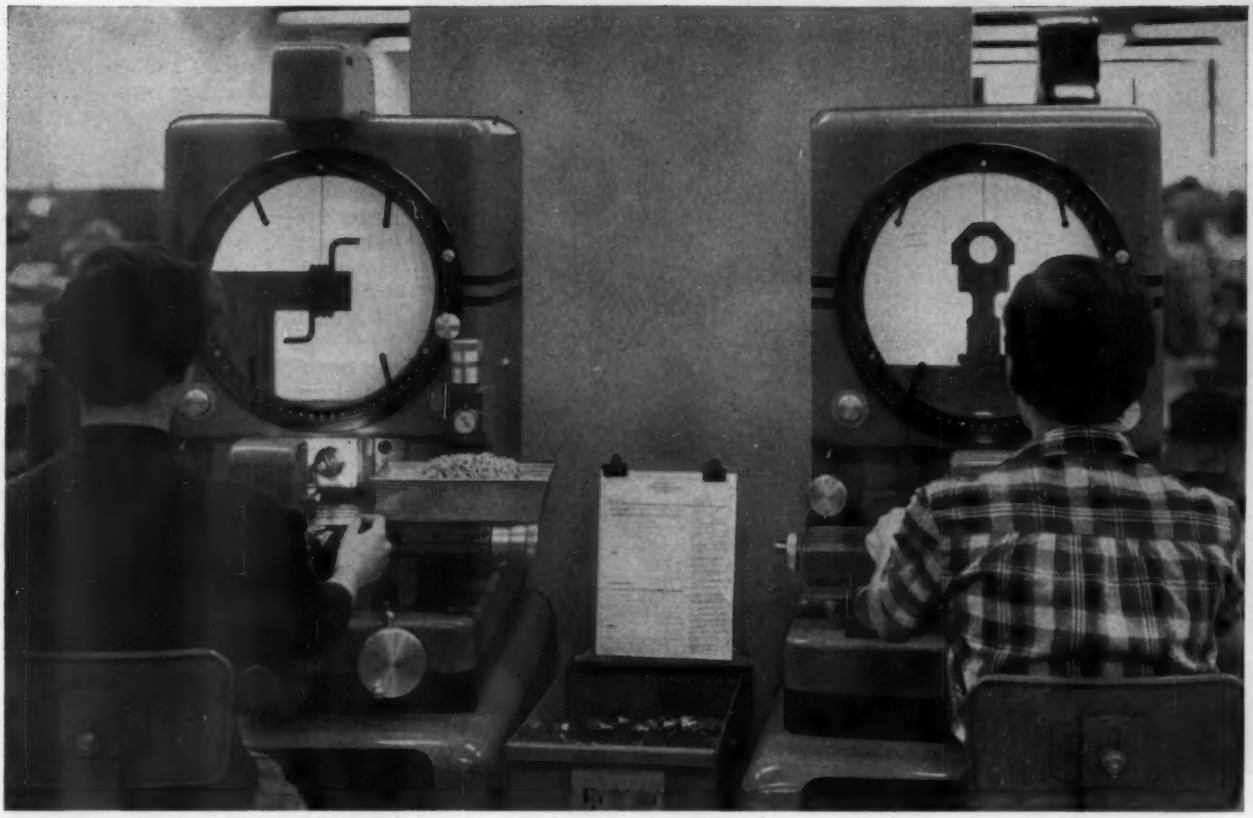

Girls at the Allen-Bradley Company, leading makers of electrical equipment, use Kodak Contour Projectors to inspect incoming precision parts quickly and accurately.

To speed parts from receiving dock to production . . . Allen-Bradley uses Kodak Contour Projectors

Receiving inspection can be a bottleneck, slowing the production operation when, on an average day, many separate shipments of component parts crowd the receiving room.

To avoid such a bottleneck and keep production lines moving, the Allen-Bradley Company combines statistical sampling methods with modern gaging equipment. Kodak Contour Projectors are used to check more than 400 different items, most having multiple dimensions and sample sizes of 35 or more pieces. Tolerances are held as close as .001".

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You'll find that Kodak Contour Projectors are profitable wherever you need fast, accurate, complete inspection or measurement of almost any sort of part—simple or complex, large or small. And there are models to fit every need from the large Model 30 to the bench Model 8. To learn more about optical gaging and how it can help solve your problems, send for our illustrated booklet, "Kodak Contour Projectors." Use the coupon below.

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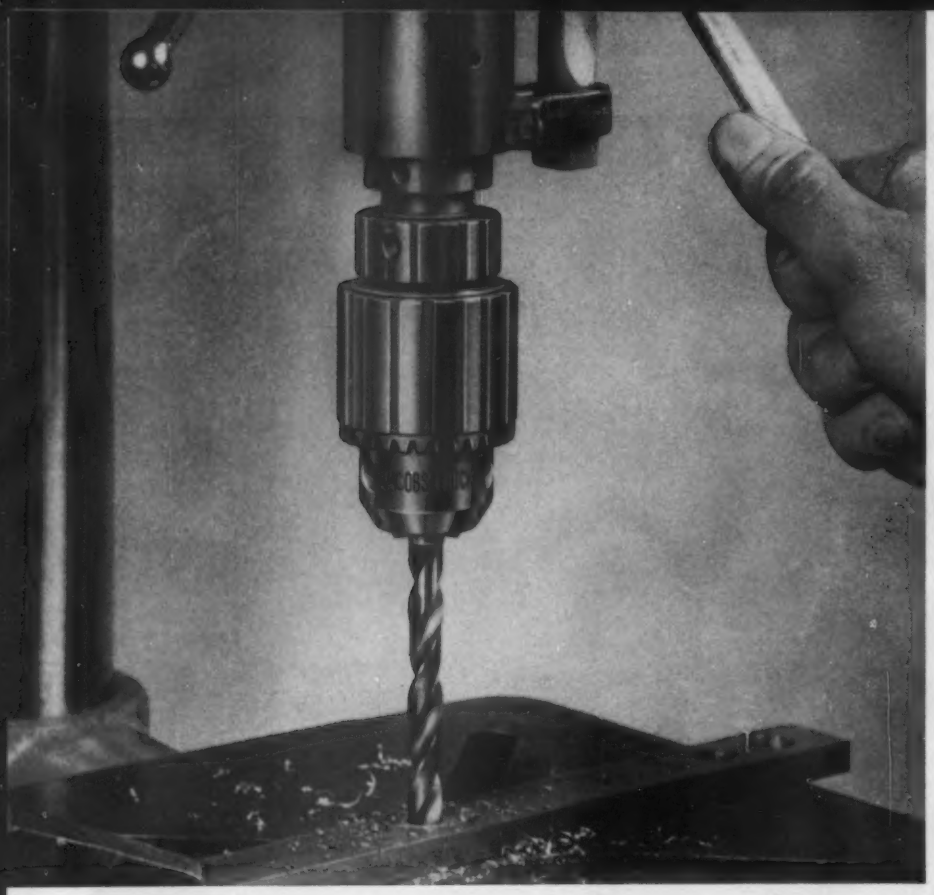

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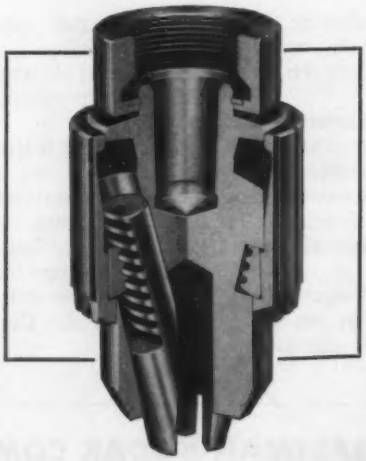
Jacobs Chucks for every tool and work holding need are as near as your industrial distributor. Call him for prompt, experienced service, or write The Jacobs Manufacturing Co., 1609 Jacobs Road, West Hartford, Conn. Ask for Catalog 100.



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CHUCKS
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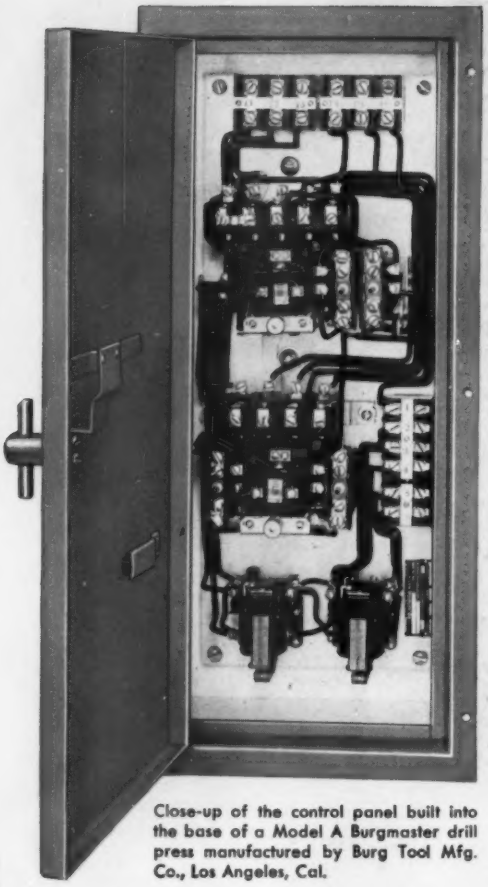
can be established before the plan is put into operation.

Each employee and each representative of management has a different opinion on the matter of how sick a person should be in order to stay home from work. It is impossible to reconcile these differences and have them all reach a common agreement, largely because of the impossibility of measuring the degree of illness or of comparing it with a standard. Does too sick to go to the job mean too sick to work at home? Some will say too sick to work means too sick to get out of bed.

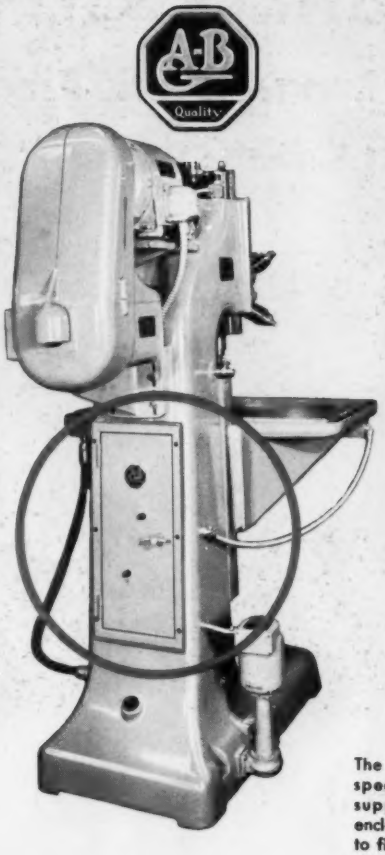
Some organizations attempt to establish a standard by requiring a letter indicating that a doctor had been consulted. This of course is not a true standard, for some will call a doctor on the slightest pretense, while others will not resort to professional advice except in extreme cases. There is no use in fighting a problem of this nature. The best procedure is for management to be realistic about it and accept the situation as it exists. Let the individual decide whether or not he is sick enough to stay out of work. What is to be done about the people who stay home even though they are not sick? Management will just have to accept this as part of the calculated risk that was, or should have been, considered when the plan was initiated.

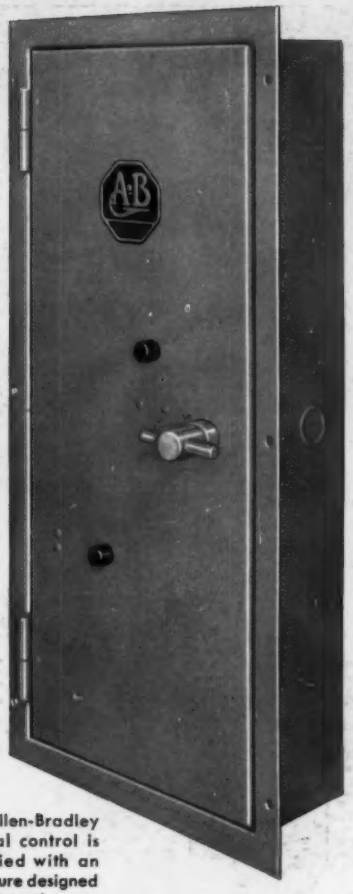
There is another side to this question; should a person be deprived of a few days off simply because he is healthier than the others? The only way these questions can be answered is to go back to the basic principles which explain the relation existing between the employer and employee. The employee receives compensation in return for his labor. This compensation is presented in a variety

"I'm not so sure I like these automatic coffee breaks."



Close-up of the control panel built into the base of a Model A Burgmaster drill press manufactured by Burg Tool Mfg. Co., Los Angeles, Cal.





The Allen-Bradley special control is supplied with an enclosure designed to fit into the machine frame.

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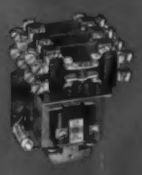

Bulletin 700 Universal 4-pole Relay

Wherever possible, control apparatus ought to be built into the machine frame. The modern, streamlined appearance will appeal to your customers.

See how neatly the Burg Tool Mfg. Co. has integrated the compact Allen-Bradley control panel into their machine pedestal. The panel is assembled from Allen-Bradley standard, catalog listed items known to be good for millions of trouble free operations.

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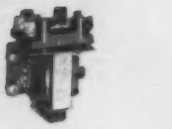
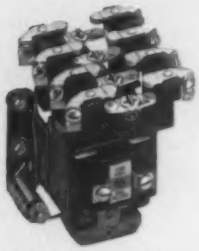
MOTOR CONTROL

QUALITY RELAYS

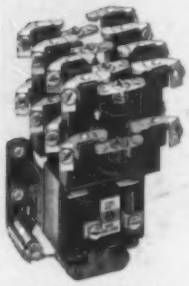
for Long, Trouble Free Service in Critical Control Circuits



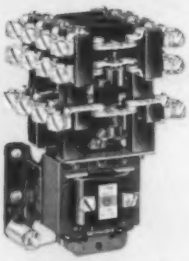
Type C-200 A-C 2-pole relay



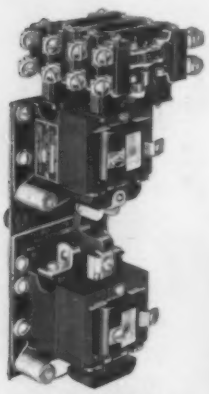
Type B-400 normally open 4-pole relay



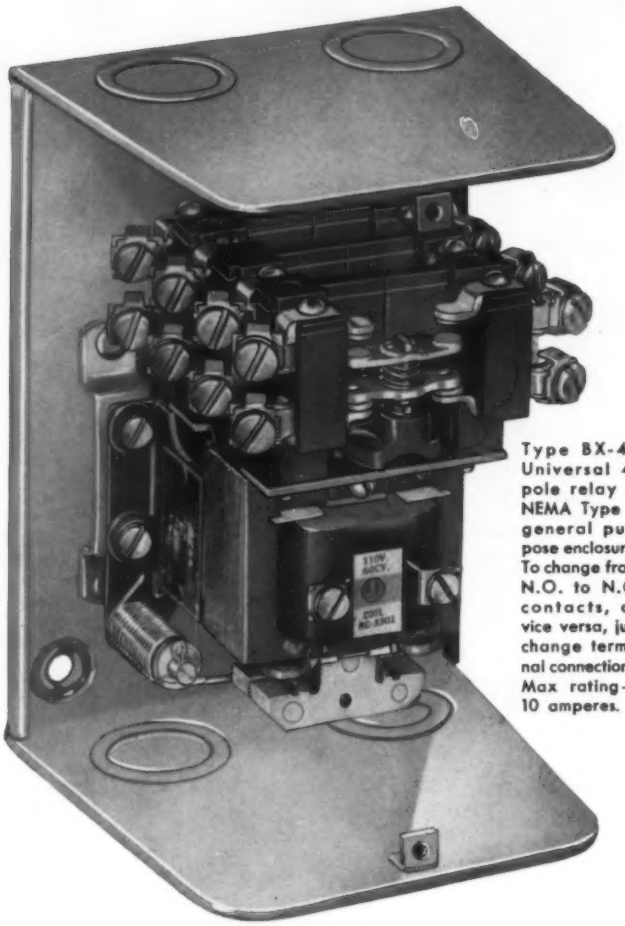
Type B-800 normally open 8-pole relay



Type BX-840 universal 8-pole relay



Type BXL-440 universal relay with latch



Type BX-44 Universal 4-pole relay in NEMA Type 1 general purpose enclosure. To change from N.O. to N.C. contacts, or vice versa, just change terminal connections. Max rating—10 amperes.

Here is a line of small relays that is ruggedly built for tough industrial service. The simple solenoid design... with ONLY ONE MOVING PART... guarantees millions of failure free switching operations. The double break, silver alloy contacts need no cleaning, filing, or other maintenance. For complete Allen-Bradley relay data, please write for Bulletin 700.

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BULLETIN 700 RELAYS
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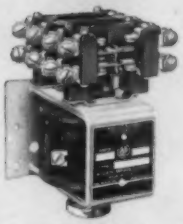
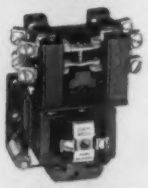
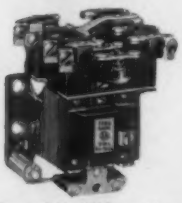


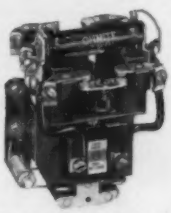
Type EX-440 D-C universal relay



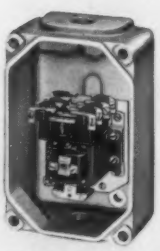
Type BX-220 universal 2-pole relay



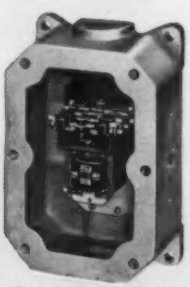
Type BM-200 mechanically held relay



Type BA-20 2-pole thermostat relay



Relay in watertight enclosure



Relay in explosion-proof enclosure

7-55-MR

of forms and is not limited to actual monetary reward. Employees receive additional compensation in the form of vacation pay, pensions, and other items of a wide variety. Are these gifts from an altruistic employer? Certainly not, they are not gifts any more than the compensation paid in cash is a gift. There was a time when compensation took but a single form; today it takes many forms, but to the employer they can all be lumped together as labor charge.

Sick-leave plans are initiated as added incentive to the employees to work in that plant. It is the hope of the employer that an additional advantage will accrue to management as a result. It is their hope that the employees will, in general, use the sick leave wisely. In this way employees can stay home when ill and thus insure more rapid recovery. It will keep them out of the plant where they may be a hazard to themselves, the equipment, and to other employees. In short, the organization is compensating the employee in this way, and it hopes it will not be misused. The same hope goes with the cash wages. The employer hopes that the employee will alot a suffiicent portion to the purchase of food and shelter to maintain him as a healthy, capable worker.

The best plan as regards sick leave is to leave it up to the employee but discourage misuse by requiring the sick employee to report daily by telephone and to report informally to his supervisor upon his return.

Henry George
Bronx, NY

HAVING BEEN AROUND machine shops in the New England area for quite a while, I have yet to hear of a privately owned shop handing out sick leave to the rank and file—unless there was some form of union contract involved. But I have had some experience of the uses and abuses of sick leave in working for the government. Human nature being what it is, there is always some individual who feels it incumbent upon him to use up his sick leave despite the fact that he is disgustingly healthy.

In the particular branch of government I once belonged to, each employee was entitled to fifteen days sick leave in the calendar year, along with a similar amount of regular leave. When the regular leave was used up I can tell you that fifteen days of sick leave looked mighty tempting. When you add to this the

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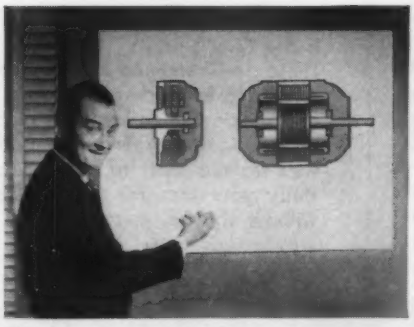
They wanted to add another machine on the line

Fairbanks-Morse Design Engineers wanted to see how *you* could get more production out of every square foot of premium production line space.

They designed the now-famous Fairbanks-Morse Axial Air Gap Motor that is much shorter than conventional type motors. That saved "motor space" can become "production space" by the addition of one or more machines to every production line.

It is this kind of design approach that typifies the product bearing the Fairbanks-Morse Seal of Quality. When next you look for an electric motor . . . a scale . . . a pump . . . a diesel engine, look for the F-M Seal and see the difference that quality makes. Fairbanks, Morse & Co., Chicago 5, Ill.



The Secret . . . is that the air gap in this motor is perpendicular to the shaft, rather than parallel as in a conventional motor . . . without sacrifice in performance.

The Result . . . is that by replacing conventional motors with F-M Axial Air Gap Motors, enough space has been saved to add one or more machines to the line.

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a name worth remembering when you want the best

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fact that sick leave meant just that and could not be allowed to accumulate as in the case of regular leave from year to year, a certain few, who are always present in every shop, made it their business to see that fifteen days' pay for doing nothing did not revert to the government treasury. "Colds" were frequent at regular intervals and certain individuals became peculiarly susceptible to them. At certain seasons of the year—when the fish were biting or a crucial ball game was on tap—the plant switchboard was kept busy in the morning handling the sick calls.

Then someone conceived the bright idea of limiting the sick calls to two per month per employee, with an absence over three days requiring a doctor's certificate. This reduced the "sick" load considerably, except for the diehards who could always find a doctor in town who would sign a certificate at the drop of a fee. Then war came along and sterner measures were required to curb absenteeism. Certain individuals were hired by the Personnel Department to investigate every sick call and report their findings. Which meant that if an employee was reported sick, and was absent from home when the investigator called, he or she had to have a mighty good excuse.

Of course, I am not suggesting that Al have his company go to extremes in protecting the five-day sick-leave period from abuse. Frankly, I believe the percentage who abuse this privilege are certainly not the backbone of any company, and form a very small minority, indeed. I don't blame Al for being irritated, however, when he overhears an employ-

"Automation has certainly made my job easier."

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DPS BARREL FEEDER

A Time-Tested Device for use on parts requiring critical selection.

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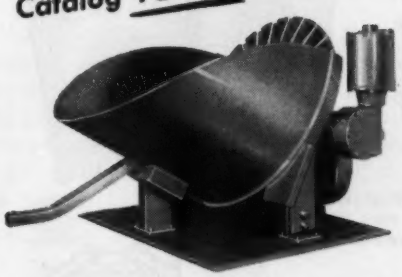
with STATIONARY RING COVER, operating on Rotary Principle, but providing 3 TIMES THE LOAD CAPACITY of other feeders. Designed for heavy-duty large production runs.



GIVE US YOUR PROBLEM
GET THE FACTS!

DETROIT POWER SCREWDRIVER CO.

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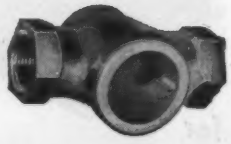
GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

perform one to three operations in sequence or simultaneously . . .

TO CUT PRODUCTION COSTS...

More completely finished parts at the end of the day with no partly finished pieces lying around is the regular accomplishment of Goss & DeLeeuw "1-2-3" chuckers. It means complete finishing on one, two or three ends simultaneously or in sequence without tool resetting, rechucking or parts handling. Machining operations may include boring, facing, turning and threading.

Change over from job to job is simple. Cost-cutting is assured on long or short runs. Goss and DeLeeuw Chucking Machines are the only standard machines of their type which operate the "1-2-3" way to reduce costs per piece and step up the number of pieces per hour.



Investigate the opportunities offered by these machines on your production by sending samples of your work for time and cost estimates—Ask for illustrated descriptive literature.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A

ee sounding off about abusing the sick-leave privilege—in my opinion a private bawling-out is in order.

Where the private company is concerned, if they feel that the sick-leave privilege is being abused they can always withdraw it. Unfortunately, this penalizes the majority of the workers for shortcomings of the minority, and at the same time does not contribute to good employee-company relations.

To sum up, we have to realize, with human nature what it is, no privilege on earth can be one hundred per cent free of abuse, and govern ourselves accordingly. In Al's case I would schedule my work around individuals who have proven themselves dependable and leave the less pressing jobs for the ones who are less likely to be on hand, judging by past performance.

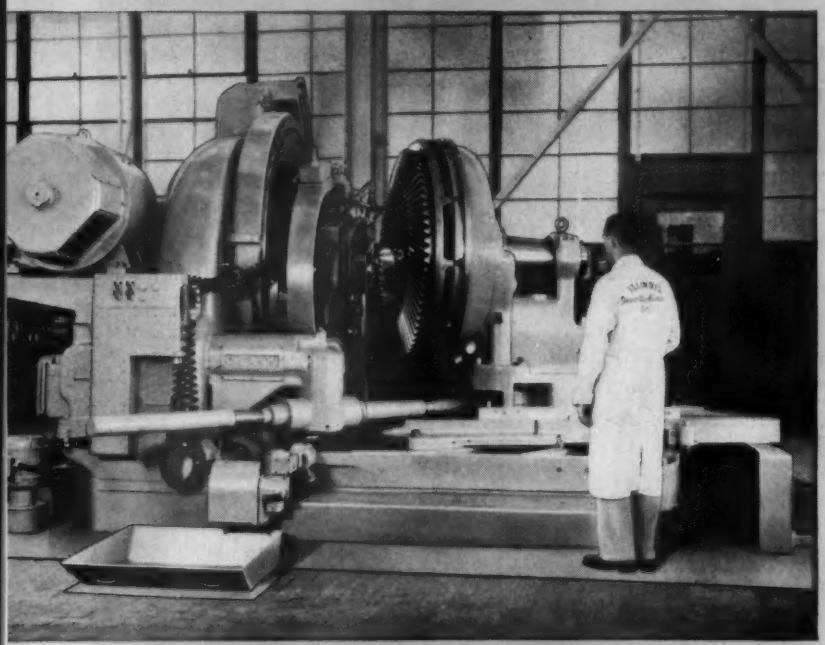
Robert S Alexander
Glastonbury, Conn

WE CANNOT very well ask for a doctor's note each time a man is out one day. It is quite possible for an employee to stay home one day to shake off a cold. There are some employees who take advantage of sick leave just as they take advantage of other things.

It is a good policy to have employees call in and report the absence the first day. When the employee is absent for three or more days, a doctor's note should be required. Employees should be made aware that any infraction of the rules will result in a less liberal allowance. At the same time we must keep in mind the fact that the employees are allowed five days and

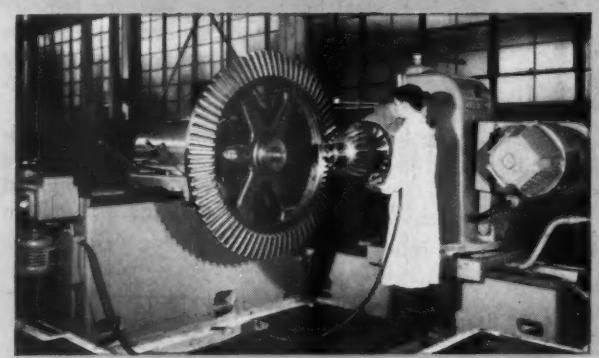
"That's what I like about Hasse . . . he's always on his toes!"

BIG SPIRAL BEVEL ZEROL BEVEL HYPOID GEARS

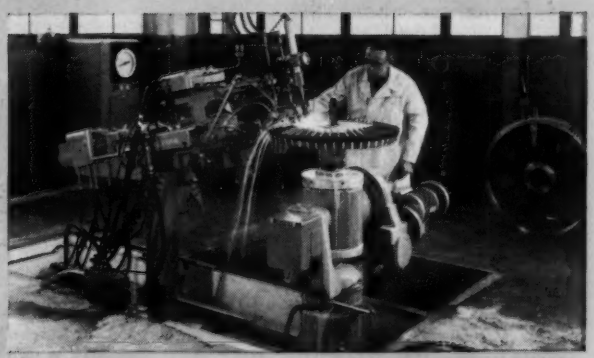


PRECISE GENERATION OF BIG BEVEL GEARS

This new No. 170 Spiral Bevel and Hypoid Gear Generator is the nucleus of the most modern and productive unit of large bevel gear generating machinery in the world. It generates spiral bevel, zerol bevel, and hypoid gears to 72" diameter, 2.875" tooth depth (.75 D.P.), 10" face, and 10" hypoid pinion offset above or below centers. The localized gear tooth bearing, an established necessity for today's heavily loaded gear drives, is precisely controlled to your specifications.



POWER TESTING—This new No. 61 Angular Hypoid Testing machine is the most advanced of its kind. Large spur, helical, herringbone or bevel gears are operated under load at any shaft angle, giving exact inspection of tooth contact under operating conditions. It will efficiently test gears up to 90" diameter and hypoid offsets to 10" above or below centers.



SURFACE HARDENING—This new No. 2 Flame Surface Hardening machine is closely controlled electronically to produce precise, uniformly distortion-free results—it's the all important climax to our large gear production facilities. Spur, helical, bevel and hypoid gears to 120" diameter, .75 D.P., and 18" face are surface hardened in this machine.

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2 How can I find a brass cleaner that gives better protection against tarnishing?

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***Answer* 1** Following an Oakite recommendation, one plater made a small change in his steel-cleaning cycle and soon had two tankfuls of cleaning solution doing the work of three—and the plate adhesion was improved. *See booklet offered below.*

***Answer* 2** Oakite has a new brass cleaner that provides scientific protection against the oxygen that tarnishes brass and other copper alloys during the application of reverse current. *See booklet offered below.*

***Answer* 3** Oakite has an anodic conditioner that offers brighter plating of zinc die castings . . . with no anodic blackening and fewer rejects. *See booklet offered below.*

FREE For more information about the electrocleaning of steel, brass or zinc die castings, ask for one or all of the booklets listed in the coupon.

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Send me the free booklets I have checked below:

☐ "Four good steps toward better electroplating on steel"

☐ "What's NEW for electrocleaning brass and other copper alloys"

☐ "Good news about electrocleaning zinc-base die castings"

Name.....

Company.....

Address.....

they are going to take all that is coming.

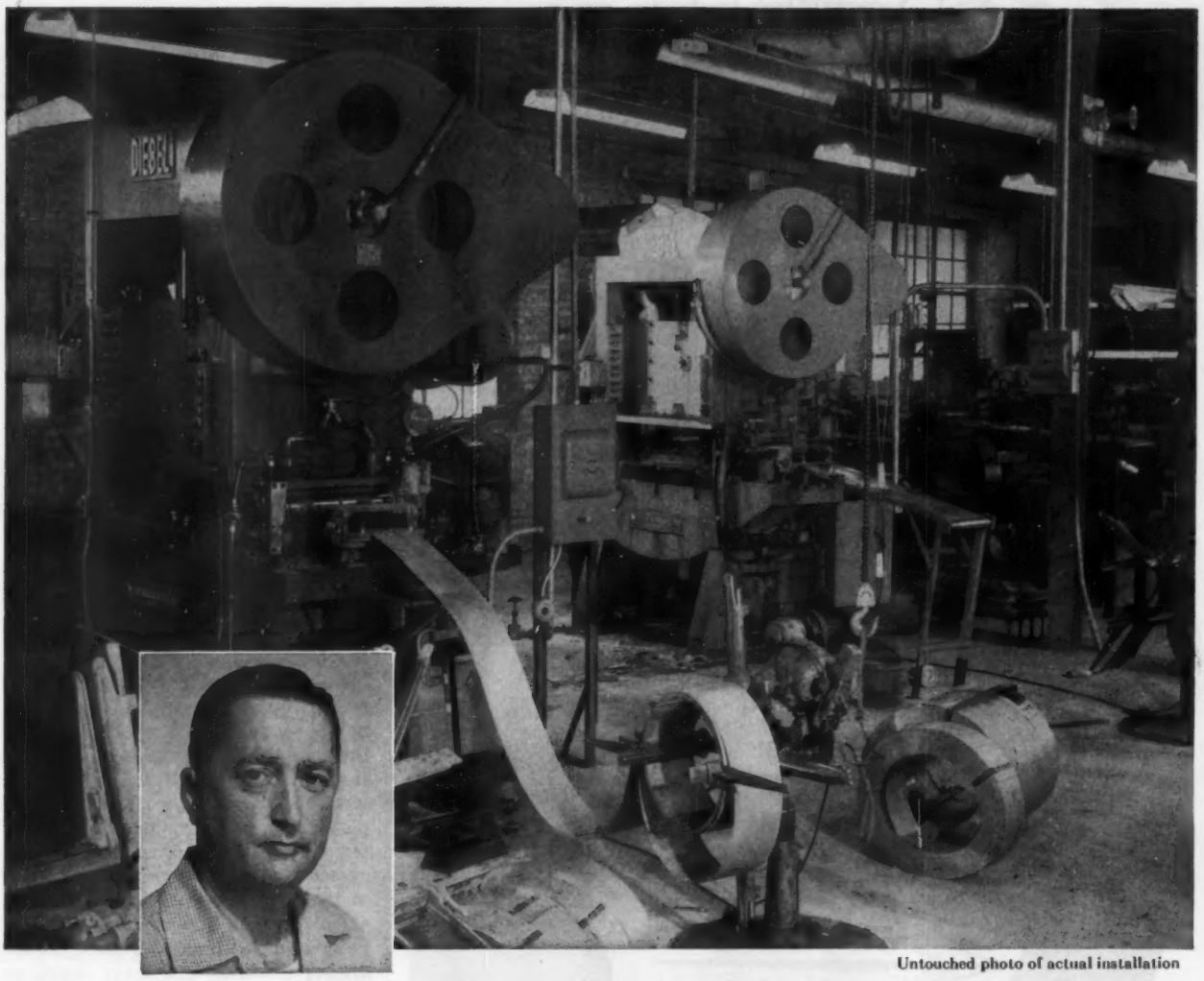
The trouble with most sick-leave plans is that the steady employee is not rewarded for his good record. The fellow who is lax and takes the five days gets payed for it. The foremen should keep a record of all lost time both in vacation and sick leave. In so doing they can better control their schedules. It will also make clear who is sincere and who takes advantage. Each man should be required to report the reason for all absence. There is no perfect way to police sick leave, but it can be controlled by keeping careful records. If we find an employee falsely reports sick we cannot be too easy going. He must be told just what is expected of him in regard to sick leave. The steady worker feels he is being penalized. Unless the steady worker is rewarded in some way he is naturally going to take sick leave.

A E Salmons
Philadelphia, Pa

THERE IS ONE infallible way to make sure that sick leave really means sick leave, and that is to have an established shop rule that each worker out on sick leave furnish a statement from his doctor stating the nature of illness that caused the absence. However, this scheme may be ideal in theory but perhaps impractical in operation, because the average one-day sickness is usually not serious enough to require medical attention from a physician.

In my experience with plant absenteeism due to sickness, I have found that the best policing method is to require the absentee to obtain

"It's something big this time . . . this is the blueprint!"



Untouched photo of actual installation

Sola Electric Gets Extra Day's Work Every Week with DIEBEL AUTOMATIC PRESS!

You need simply observe Sola Electric Company's progressive press room re-equipment program to see why they are a leading manufacturer of constant voltage transformers and fluorescent ballasts! Doing it faster, better, more economically . . . doing it automatically is the by-word at Sola!

As Max Haussler, in charge of tool making and metal working operations, explains it, "Our first installation of the program was a Diebel 60 Ton Automatic Press for stamping laminations. We soon discovered that the Diebel Press was giving us a 30% reduction in labor costs of producing laminations."

"In addition, we increased production between grinds by 30% and *die chipping was virtually eliminated!* Then too, down time and set-up time has been cut in half and maintenance costs are next to nothing! As our records show, we are getting an extra day's production every week over the former operation . . . thanks to the Diebel Press!"

In these times, can *YOU* afford anything short of a fully automatic press room? Diebel Presses are compact, self-contained, fully automatic *factories* in themselves, delivered completely equipped and ready to work for you . . . even the die if you choose!

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a physician's certificate for absence in excess of three work days. On this signed statement the doctor certifies that the employee was under his professional care during the period of sick leave, and gives the nature of his illness. For sick leave up to three days, no doctor's certificate is required, but the absentee on return to duty is given an interview by the Personnel Department, or foreman, and a record is kept of the employee's statement regarding the illness. If the record indicates a chronic condition of absenteeism, then further action by Personnel or the foreman is necessary. This may take the form of seeing that the employee secures medical attention either through the plant doctor or locally. Or it may take the form of disciplinary action if investigation proves that the man is a malingerer. Where the record indicates that the employee has been making a habit of taking individual days off as sick leave, a spot check is made by a member of the Personnel Department who is sent to the employee's home to verify the authenticity of the fact that the employee called in that he was too ill to come in to work that day. The fact that employees know they may be checked for verification of their one-day illnesses has tended to reduce the abuse of the sick leave privilege.

An Absence Report Form has also been used with good results in reducing unauthorized leave taken as sick leave. The mechanics of the operation of this procedure are that the foreman has to fill out the form for the employee's absence in triplicate, getting the worker's reason why he was absent, giving the man

"We were one of the first to achieve 100% push-button production—we started making push-buttons!"

a copy, keeping a copy himself for his records, and forwarding a copy to Personnel Department for their records. This absence form system helped to reduce unauthorized absence by determining the causes that could be corrected and thus reduce these interruptions to shop production and efficiency. It put on record those workers who were the worst offenders, aided in shedding some light on the causes of the absences, and brought about their reduction and elimination.

It was found that there was a hard core of habitual absentees who offended over and over, while their fellow-workers turned in satisfactory attendance records year after year. When these men were identified and a line of attack on the problem of their absence had been laid out, the solution of the problem followed. Giving the offender a copy of the report will serve as a warning and possibly aid in curbing further abuse of sick-leave privileges. Furnishing the Personnel Department with a copy will aid it in formulating suggestions, through study of the reports, to the operating people for minimizing absenteeism.

Of course it would be better for all employees if they would really use such sick leave for days when they are sick. They wouldn't spread around colds and fever, which only cost the company more money in lost time.

I believe that one way to skin this cat of "sick leave or free vacation" is to combine them, so that unclaimed sick leave would be accumulated and could be taken as vacation. It would be better if the 5 days of sick leave with pay which is granted each man is added to the regular vacation time and the whole thing called vacation. Then any absenteeism, whether for sickness or for any other reason would be charged against the vacation time allowance. This might have the inherent advantage of discouraging absence for trivial indisposition or plain disinclination to work that day if the man knew his relatively generous vacation period would be shortened by taking unnecessary sick leave

The man who admits that he used up two "sick-leave" days to go hunting is, to my way of thinking, a clear case of unadulterated brass. This attitude defeats the purpose of sick leave with pay and raises the question as to whether sick leave, as such, stated in a number of days per year, is economically sound as a policy.

I do not approve of giving the men the money for their five days un-

SHELDON
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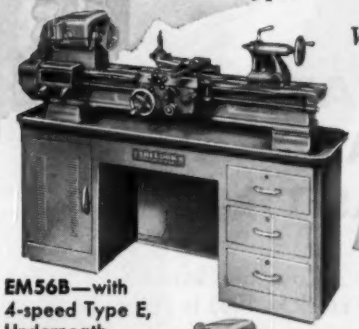
MORE POWER
at the Spindle Nose

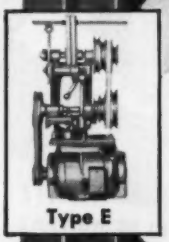
The greater work capacity of 10", 11" and 13" Sheldon Precision Lathes comes in part from their extra power. Compared to other lathes of similar swing and price, Sheldon Lathes are built to take larger motors. Sheldon Motor drives are better engineered and better built. In place of a single ordinary V-belt to drive the lathe spindle, these Lathes have twin, Neoprene, cog V-belts (each capable of delivering 40% more power than an ordinary V-belt).

The greater wrap-around of Sheldon's twin cog V-belts not only delivers more power at the spindle nose—permitting heavier cuts, they also eliminate slippage at the spindle—increase accuracy of work. Made of oil, heat and static resistant Neoprene, Sheldons Spindle belts have a longer life expectancy than other belts of similar type.

Write for New G-55 Catalog

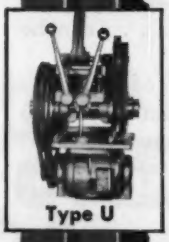


EM56B—with 4-speed Type E, Underneath Motor Drive in Cabinet base.



Type E

See our display at the Western Metal Show, Booth 614



Type U

UM56P—with 4-speed external lever shift type U, underneath Motor Drive in heavy cast iron Pedestal base with storage space in tailstock leg.

SHELDON MACHINE CO., Inc.

4234 N. Knox Ave. • Chicago 41, Illinois

MACHINABILITY INDEX 80-90*

PEARLITIC MALLEABLE CASTINGS

* B1112 STEEL = 100

Low machinability index of 80-90 (B1112 steel = 100) is probably reason enough to warrant serious consideration for your product.

But pearlitic malleable castings—from National—don't stop there. They have great ultimate strength . . . resist wear under heavy loads at high speeds . . . make excellent non-seizing bearings . . . can be air or liquid-quenched . . . can be smooth-finished.

Don't overlook the advantages of pearlitic malleable. For pearlitic malleable castings—from National—can often reduce manufacturing costs, weight and assembly time . . . can increase the sales potential of your product.

AA-1206

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

Cleveland 6, Ohio

The Nation's largest independent producer of malleable and pearlitic malleable

taken sick leave at the end of the year. It will probably defeat the whole purpose by encouraging money-hungry individuals to take too many chances with their health by coming in sick and exposing others to illness.

Harry Kaufman
Philadelphia, Pa

THE CORRECT interpretation of sick leave by the employees is dependent upon the value they place upon their own conscience.

If a firm establishes a certain amount of time per year, or month, allowable, with pay, to compensate its workers for their loss of time on the job because of some illness, doesn't it seem only right that the worker should accept the arrangement with a certain degree of sincerity? Does it not resolve itself into a question of what constitutes being sick, or can we pin it down to determining just what is right? Then again there are those who don't give a tinker's damn what is right so long as they are getting their share or more, regardless of the loss of the other guy.

We can define the word sickness in pretty lengthy terms covering the physical, mental, psychological and whatnotical. We are all acquainted with the physical irregularities customarily experienced in this life of rat-racing, frustrating speed, and rapid changes in our mode of living. These are all potential contributors leading up to an excuse to take a day off from work. A man can have a headache too severe to permit him from carrying on his work; a pain in the neck (literally), or a score of such irregularities—excuse enough in themselves to justify him remaining at home. These in themselves are legitimate excuses.

Taking a day off because a man is

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Spur Internal
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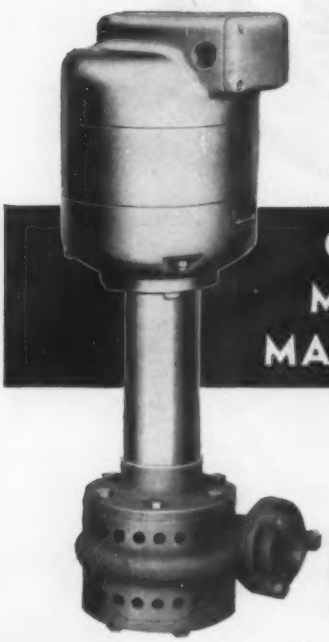


Ruthman GUSHER coolant pumps

ON THE LEADING MACHINES AT THE MACHINE TOOL SHOW

You'll see Ruthman Gusher Pumps on many of the important new machines at the Machine Tool and Production Engineering Show, because leading machine tool manufacturers know that Gusher Coolant Pumps are precision built specially for the exacting requirements of Machine Tools. Specify Gusher Pumps on your new equipment for best results.

MODEL 11021

THE RUTHMAN MACHINERY CO.

1818 Reading Road Cincinnati, Ohio

worried over some financial difficulty —that is, he doesn't feel as though he can carry on his work properly because of so much disturbance to the proper functioning of his mind or, perchance, he has had a hell of a row with his wife because she gave him the cold shoulder the night before, reflects a mental state not conforming to ideal working mastery and should be classified as sickness.

You've brought up a good question, Al, and it's up to you to find the answer. So far as trying to determine whether a man is sick or just stalling in order to get the day off is heading up a dead-end street. Regardless of how well your system of sick-leave pay is planned, until we reach the point where each and everyone practices the Golden Rule instead of getting by with anything in order to feather one's nest, no fast and hard rule can iron out the bumps.

John Homewood
Burbank, Calif

THERE IS NO way to police sick leave without causing hard feelings between labor and management. Use one of progressive management's ace methods to remove the abuses possible in a paid sick-leave plan. Develop job satisfaction among your employees.

Policing is a thankless task in any industrial plant. It gets immediate action without lasting results. A program to develop job satisfaction requires time and considerable effort, patience, and determination, but it gets lasting results.

Employees resent anyone snooping into their personal affairs. Yet, when the personal affairs of employees add to the cost of production, something must be done about existing conditions. Free enterprise is a

NICHOLS / TWIN MILL

two heads are better than one ....for sure!

The Nichols Twin Mill is something new in duplex millers — a precision 2-spindle bed-type miller designed for simultaneous light duty milling of opposite or adjacent surfaces, using **horizontal or vertical spindles.**

The Twin Mill provides unmatched flexibility! It is equally adaptable for long-run or short-run jobs. The two geared milling heads are independent units, with separate 1 HP motor drives, and are quickly adjusted either directly opposed or offset longitudinally, vertically or transversely. Set-up is fast and simple.

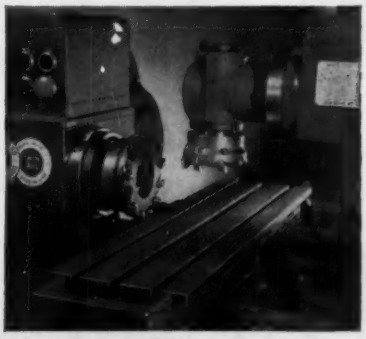
The wide range of spindle speeds from 55 to 2050 R.P.M. allows milling of ferrous or non-ferrous materials with high speed or carbide tipped cutters, producing EXTRA FINE FINISH while maintaining the closest tolerances with ease.

The Twin Mill is completely push-button controlled, arranged for automatic table cycling—with rapid approach, hydraulically controlled variable cutting feed and rapid return. Available with automatic retraction of milling heads, automatic spindle brakes and carefully engineered special features to meet specific applications.

The parts shown are typical of those on which the Twin Mill is cutting costs and boosting production. Investigate the savings it can make for you. For details write to Nichols-Morris Corporation.

CONDENSED SPECIFICATIONS

Table, working surface	8⅝" x 30"
Table Travel—cutting stroke	11¾"
Motors	(two) 1 HP
Spindle Speeds (15)	from 55 to 2050 RPM
Max. height center of spindle above table	11¾"
Max. offset of spindles (horizontal)	8½"
Max. distance between spindle noses (across table)	16"
Floor space required	64" x 56"



Manufactured by W. H. Nichols Company, 48 Woerd Avenue, Waltham 54, Mass.

76-F Mamaroneck Ave. NATIONAL DISTRIBUTORS NICHOLS-MORRIS CORPORATION White Plains, New York

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With Scott Wipers
and controls . . .
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Distribution is simple
The Dispenser-box is a portable supply
of 125 wipers

waste men and money handling wiping!

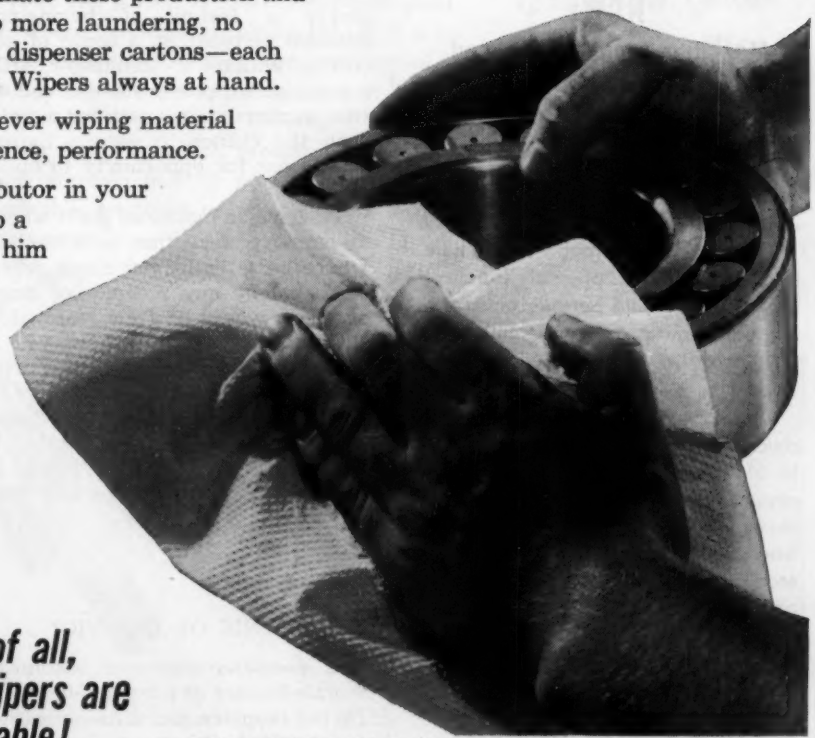
you can eliminate expensive handling . simplify distribution—budget your wiping jobs

Check your wiping operation for these unnecessary expenses—sorting, baling, counting, laundry and laundry shrinkage. Check especially for production time lost when operators leave their machines to get clean wiping material.

Scott Wipers are designed to eliminate these production and profit losses. They're disposable—no more laundering, no sorting or baling. They're packed in dispenser cartons—each worker has a mobile supply of Scott Wipers always at hand.

Compare Scott Wipers with whatever wiping material you're using now—for cost, convenience, performance.

The Scott representative or distributor in your area stands ready to help you set up a production line demonstration. Call him or mail this coupon today.



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"Perf-Embossed"® texture gives Scott Wipers their dirt-gripping, oil-drinking power.

And, best of all, Scott Wipers are Disposable!

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Please send me full information on Scott Industrial Wipers.

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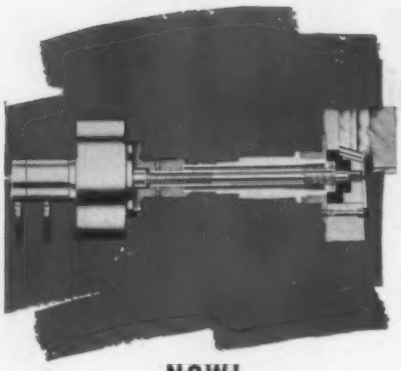
NEW

SKINNER

"JUNIOR"

POWER CHUCKING UNIT



NOW!

Maximum production speed for your small lathes TOO!

This Skinner "Junior" unit can be adapted to almost any small lathe with 1" to 1⅜" hole through the spindle. It is light in weight, precisely balanced to minimize spindle bearing and braking loads, and provides extreme repetitive accuracy on internal and external work.

The Skinner 8" self-centering power chuck has gripping capacity from ¼" to 6". Its ¼" jaw travel exceeds the capacity of any collet, and is particularly valuable on production work where rough or finished holding diameters may vary beyond a single collet's ability to grip.

The Skinner "Junior" unit is complete. It contains chuck, 6" aluminum air cylinder, adapters, draw bar, etc.

Write Skinner or your nearest Skinner distributor for illustrated folder.

THE CREST SKINNER CHUCKS® OF QUALITY

THE SKINNER CHUCK COMPANY

203 Edgewood Avenue, New Britain, Conn.

system under which all costs must be carefully controlled.

The growth, in fact the very survival, of an enterprise, big or small, depends upon control of predetermined costs. Management is jeopardizing the job security of its employees when it tolerates the abuse of privilege which will increase production costs. Using sick-leave benefits to get free paid vacations is an abuse.

Sometimes employees fail to report for work for no legitimate reason. It may well be that the employee is sick of his job, sick of his boss, or sick of his job associates. Truly, a short vacation, paid for with sick-leave benefits, is a good cure for such ailments. Job satisfaction is an even better cure. It is less costly, and it provides many additional dividends. It is the key to most employee-relations problems.

Job satisfaction, as Mr Burnham Finney editorializes in the March 28, 1955 issue of AMERICAN MACHINIST, is obtained by giving the employee a feeling of belonging, personal recognition, a sense of security. William C Menninger, MD, a psychiatrist, points out that industrial workers are not satisfied merely with the chance to earn a living. They want the opportunity to build a life.

Show me an industrial plant where an employee feels that he is needed, where he is called by name when contacted by any member of management, where he feels reasonably sure of his job. I'll show you a plant where the paid sick-leave privilege is not abused. where there is loyalty, cooperation, and a determination to be competitive.

Peter A Seward
Swampscott, Mass

PICNIC OR CLIQNIC?

Are company-sponsored outings a morale-builder or a trouble-breeder? Do the shopmen feel it an obligation to attend? Is it better to keep work hours and off hours separate?

THERE ARE two lines of thought relative to such things as shop picnics and the like conceived to stimulate better relations between employees and between employees and the employer. One is Ed's viewpoint, let us call it the laissez faire policy, where one is inclined to let well-enough alone. The other is that back-slapping, or hell-raising theory, which in general tends to loosen up the frozen hinges of industrial companionship.

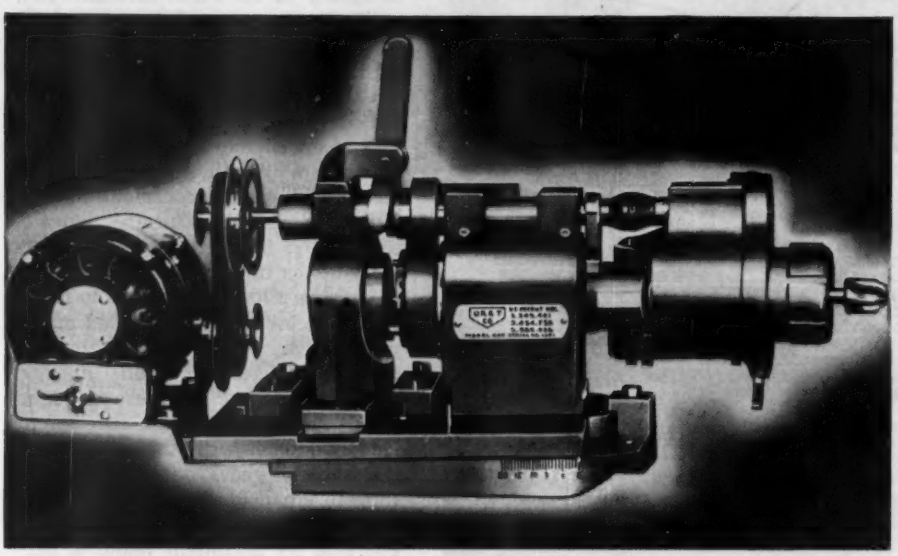
Undoubtedly our austere and individualistic friend, Ed, has had some costly experiences which make him take the stand he does. He probably has found that the workers get too familiar with each other as the result of picnic associations which invariably carry over in too-harmonious relations, adversely affecting the efficiency of their work. Familiarity breeds contempt and contempt gives birth to longeared jackasses always on the alert to find out something about another's business.

As my thoughts go back a few decades I am reminded of two workers who worked in absolute harmony until one of Ed's dreaded picnics paved the way for trouble. Family minglings developed into feuding in time and the two men were naturally influenced by dictatorial wives who made the poor guys' existence nothing short of miserable. A nice condition for shop pals to have to put up with just because a couple of wives went around like a pair of hair-raised felines—all brought on by a shop picnic! So you see, Eddie, you do have cause for suspicion of picnics supposed to be created for raising the morale of the shop crew.

Ed brings up a good point when he asks why the men should get to know each other better. The chances are that the one, the reserved type, wishes to mind his own business and do his work, while the go-getter, the picnic hound, has designs on him for some reason contributing to his own interest. I've seen that brotherly type of individual who purrs along

"Charlie, I says, there's a guy with some brains . . . He'll be glad to lend you $5 until payday!"

Precision CIRCULARITY GRINDING ATTACHMENT



Simple, speedy set-ups on this accurate attachment permit fast and easy grinding of form relief, radial relief, form and radial relief together, tapered cylindrical and straight cylindrical. Cutting tool to be produced or reworked is held in collet or between dead centers and revolves on its own axial center. Where full length of spiral cutting tools is to be ground for both form and radial relief, the Circularity Grinding Attachment travel is similar to an O.D. grinder, which insures fine finish, back taper and accurate size.

The Detroit Reamer & Tool Company Model 500 Circularity Grinding Attachment shown above is faster, easier to handle, has positive control, greater adaptability, rugged construction, and is engineered and precision built to provide the finest in precision work. Therefore, it will be of invaluable assistance to anyone whose tooling standards must meet modern production requirements.

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like an eight-cylinder cat to get you to open up and then sets his trap to spring at the right moment. Ed, no doubt, treats his job as a purely business proposition and is successful in conducting his relationship with his men because of that reason.

The opposing foreman has probably seen picnics where beer was on tap. While this is greatly objected to by some conscientious individuals who have pretty delicate scruples, it is felt that the gulping individual's thirst must be taken into consideration. This brings to mind a shop picnic my dad attended many years back where, in addition to the other digestive tidbits in evidence, barrels of troublesome lager were drained in rapid succession. Dad had been with this firm for a good many years and he and the shop foreman blotted up their share of this "harmless" drink and soon got into an argument about a certain job going through the shop at the time. My old man, who carried a mean fist in his younger days, forced the issue to a scintillating conclusion where sparks of alcohol and temper freely mixed. If the rulings of the Romans had prevailed my pop would have taken over the foremanship but no, it wasn't to be, he was canned before he donned his overalls—in fact, before the belts started to squeak.

Albert Hodges
Victoria, B C

Ed is definitely acting like a grouch. There is no advantage whatever in trying to keep good-fellowship among workers confined to the shop and frowning in it outside the shop. The opposite is true.

Shop picnics, most of us agree, are for children, for promoting better

"This is our deluxe model, carbide tips."

family relations, and for the purpose of getting to know and understand our associates better. In these days of (I dare no longer say) cheap cars, good roads, state parks, the radio, the television-equipped and air-cooled cocktail lounge, there is so little excuse for getting family groups together, that those that are left had better be cherished and kept green.

As a little boy, I remember my father—he was Station Master—taking me down to the station in Harrisburg, Pennsylvania, to see the Altoona shopmen go through on their way to ther annual picnic in Willow Grove Park, near Philadelphia. Was that a sight! Trainload after trainload of festive-minded folks, men, women, and children, dressed in their Sunday best, going all out to celebrate their Day—their Picnic!

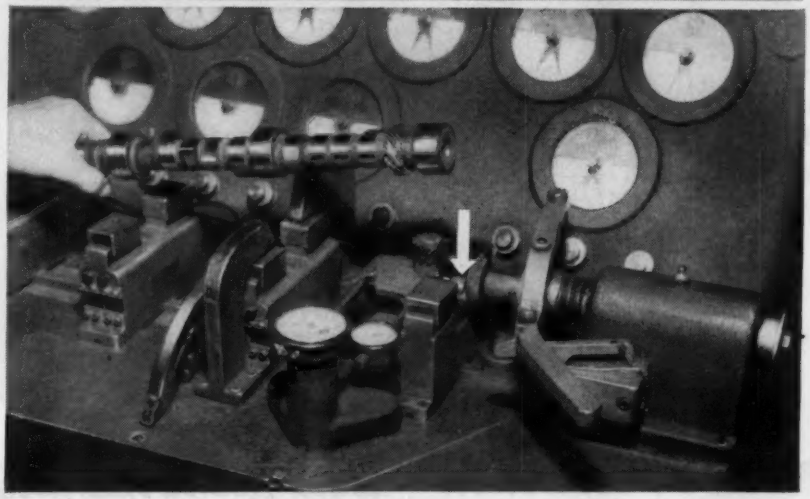
The cars were decorated with gay bunting and streamers that carried such signs as "THE BOILER SHOP," "MASTER MECHANIC'S OFFICE," "ERECTING SHOP NUMBER I," and many others. At Harrisburg, they had already ridden 126 miles and two and one-half hours, and they still had 105 miles farther to go. Who, today wants to ride 440 miles to their picnic grounds? But fifty years ago the folks took their outings seriously.

Nine out of ten car windows were up, and there were no screens, but just who cared about cinders anyway? The young girls were in white dresses, and wore bright-colored hair ribbons—women wore hair then. Always there were a number strumming mandolins, singing songs, tossing idle chit-chat back and forth. The children were drinking birch beer and eating bananas. Many of the young men were decked out in hot flannel baseball suits; at stops, they hurled challenges across the platforms to rivals in another section of their special. And in the baggage car ahead, and in the one behind—there were no tubs of liquid vice on account the Pennsylvania Railroad leaned heavily on RULE G. It could be that an occasional brave soul might be found with a half pint of unbonded something on his hip—but I never was a stool pigeon.

But principally, those picnics—and I hope they still have them—were for the whole family. The children ate, drank, slept, ate again, and in between chased the grounds and rode the merry-go-round. There were young lovers, and there were athletes who performed. The older men talked shop, built locomotives, and just watched. The women, as always, dished out the food and

FLP SERVICE MARK Design NEWS

News of Another Design Problem Solved With Flame-Plated Tungsten Carbide Coatings.



The master rolls of this camshaft gage (see arrow) have been Flame-Plated with tungsten carbide. Service life has been increased 32 times.

Flame-Plated gage rolls last 32 times longer

The short service life of master rolls in a special camshaft gage posed a knotty maintenance problem for a large automotive manufacturer recently. It was discovered that a groove would appear in the regular high-speed steel rolls after gaging 2400 pieces in the course of two days' operation. This situation meant that the rolls had to be changed frequently and, what was more important, the possibility of passing sub-standard parts was increased.

This problem was solved by having the steel master rolls Flame-Plated with a coating of tungsten carbide. The hard tungsten carbide coating resisted wear to such a high degree that no grooving was evident after 78,000 pieces . . . three months' work . . . had been passed through the gage. The result? Less down time and a high degree of accuracy over a long period of time.

Flame-Plating is LINDE's process performed in LINDE's plants for depositing a tungsten carbide coating on metal parts. Finished or semi-finished parts made of most metals can be Flame-Plated without distortion as the temperature of the part being plated does not exceed 400 deg. F. The coating may be used in as-coated condition (similar to fine emery paper) or ground to a fine finish.

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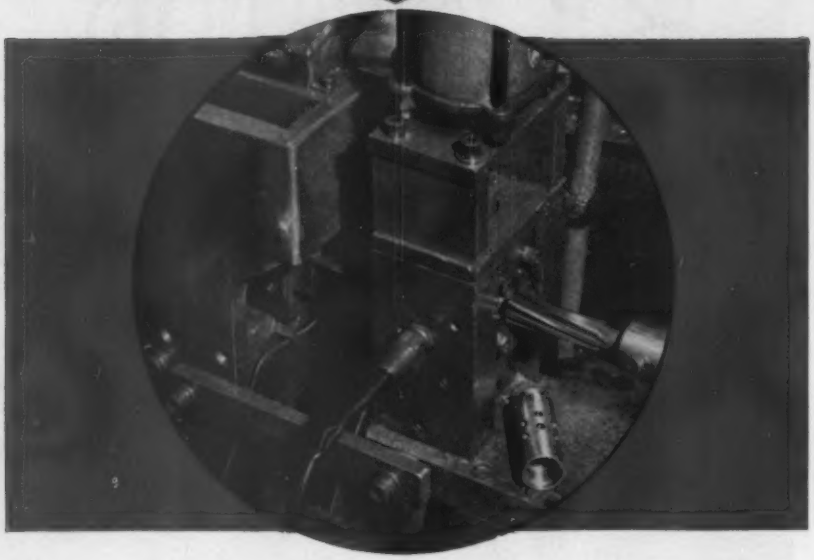

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Shown above is the automatic reaming of fin assemblies for 60 M.M. mortar shells at Columbia Electric Products Company, Spokane. Standard Whitman & Barnes high speed reamers are used to remove the heavy burrs of 16 radially drilled holes in each piece. The reamers are operated at 800 R.P.M. and the production rate is 1,500 pieces per hour. The outstanding performance of these W & B reamers is evident in the fact that Columbia Electric obtains 11,000 reamed fin assemblies per grind. For better reamer performance—specify W & B.

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gossiped. There was dust and the sun was hot, but who cared? Five hours to get there, 14 hours on the ground, and five hours to get back to Altoona! Yes—that was a picnic. Did they do any good? I'll say they did. No sooner was one picnic over than a committee was working on the one for next year.

Since then, I have managed several plants in which an annual picnic was a long-established event. I learned that amusement parks sent representatives around the country to solicit business for their parks. To obtain a large shop picnic, a park makes concessions, free rides for the children, free lemonade, balloon ascensions, free orchestras for dancing, and other bait. Best of all, and thanks to the women, the good parks are now equipped with shining white tile comfort accommodations. Anybody who remembers the filthy six-holers of yesterday will appreciate those lovely white-tiled rooms with attendants—those clean places where a child can be serviced properly and promptly.

And Ed wants to discourage that remaining emblem of American Life as she used to was—the shopmen's picnic? Shame on him! And not quite in the emphatic words of that memorable speech by Senator Smith from Arkansas—

Step on the American flag. Insult the Godess of Liberty—compare the pickled bones of a Peruvian prince with the muscles of a Roman gladiator, and your crime could be no worse—Change the name of Shopmen's picnic to Stag Smoker—not by a dam sigh!

James K Matter
Detroit, Mich

HAVING BEEN among those present at several company outings, I am in-

"The coffee machine wasn't heating up, so . . .!"

HOW TO RATE A CUTTING OIL

FOR HIGH PRODUCTION ON TOUGH JOBS

There has never before been a cutting oil selection chart such as Atlantic now offers. It rates oils on job efficiency, not just chemical composition.

This cutting oil chart uses 3 variables to give you the "Cutting Units" which can then be used to select the proper Atlantic Cutting Oil for the job.

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2 *Lists* **TOOL MATERIAL**—*by type and composition*

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4 *Selects proper* **OIL**—*by cross reference of Cutting Units it names the Atlantic Cutting Oil to use*

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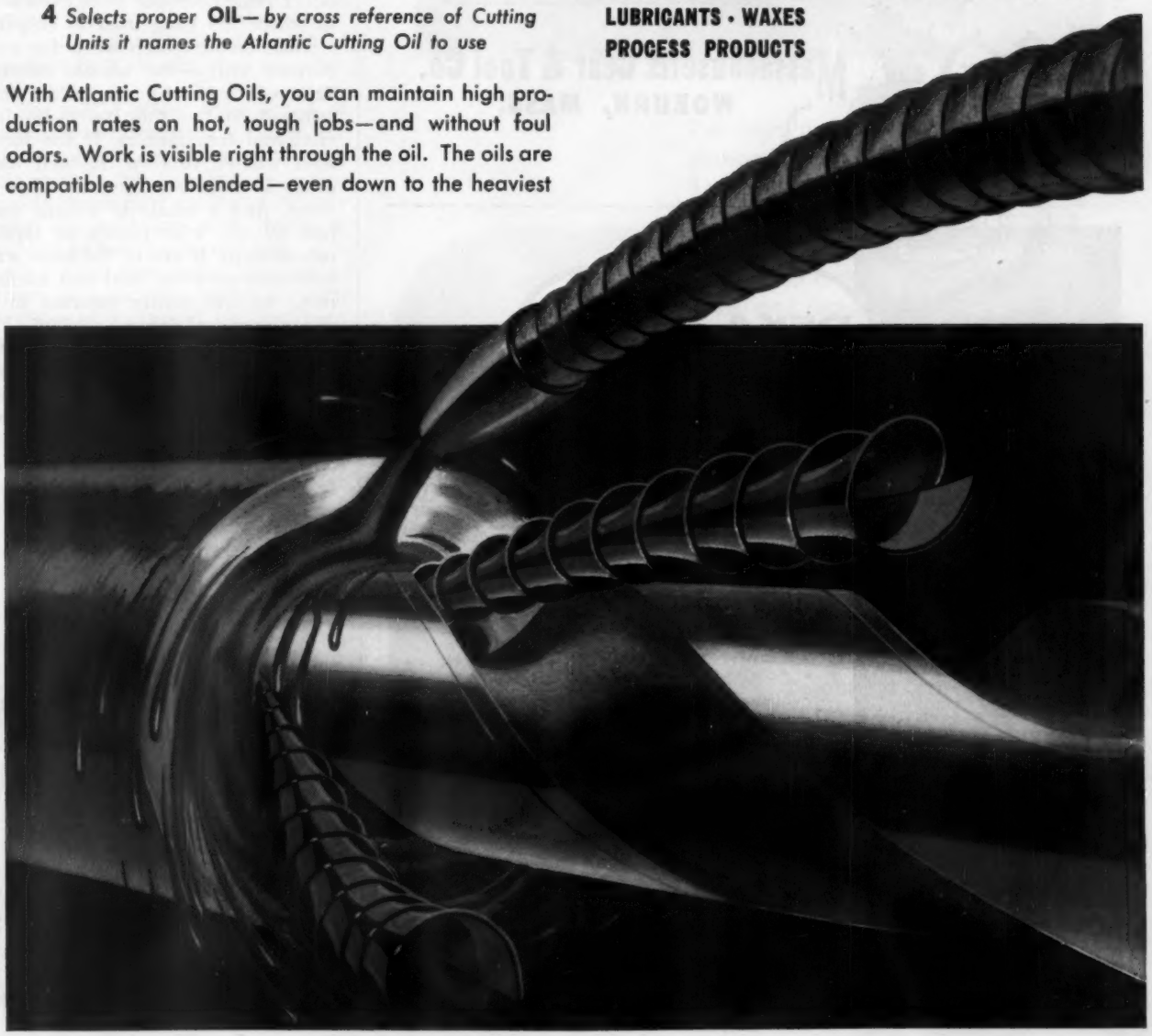

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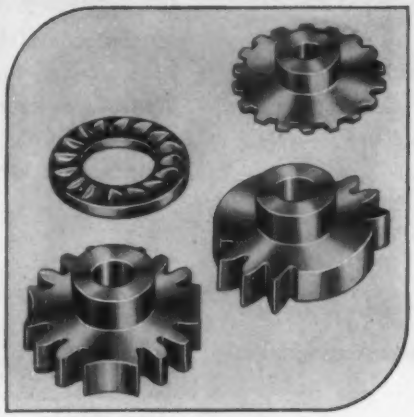

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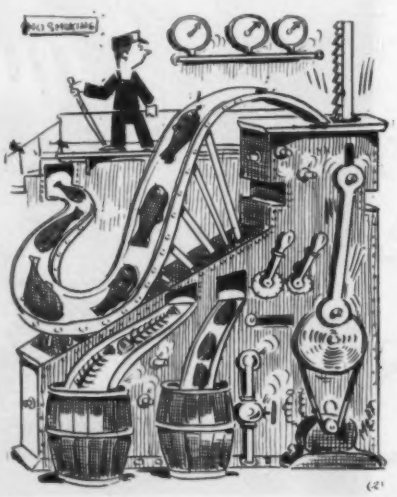
clined to agree with Ed's side of the question, that by and large, they are as our English cousins put it—a crashing bore. Most of the participants are so busy putting their best foot forward for the big brass that they forget that the purpose of a picnic is to relax and have a good time. On the other hand, you are likely to find a few individuals who go to the company outing and imbibe too freely. They are so completely relaxed that their shop inhibitions and limitations go completely overboard, with the result that some of the bloom is rubbed off the occasion, and quite a few egos deflated. Which, of course, entirely defeats the purpose of the get-together — which was to spread sweetness and light.

I agree with Ed too that the best outings are those where a bunch of the boys get together on their own —without benefit of suggestion from "above" and conduct their own affair. I remember one shop I worked in where the gang used to chip in a small amount each week for one purpose only — the annual outing. This was a strictly stag affair and confined to the shop only—no invitational free loaders. If the foreman wanted to chip in, well and good, if not—but he was always there. And a whale of a time was had by all, with plenty of liquid refreshment. If one of the boys was overcome with the heat and excitement he was gently escorted to a shady spot and left to cool off.

At the risk of being ostracized by the fair sex I think the wife and kiddies should be left at home, so that Dad can enjoy the company of his own kind, and perhaps hoist a few without the disapproving wifely eye. So far as the kids are concerned, they can get into a neighbor-



hood brawl without it affecting the old man's chances of promotion or spoiling a beautiful friendship with the guy on the next machine.

If Ed is acting like a grouch, then he has a lot of company. His idea of trying to keep work-hours and off-hours separate appeals to most men I have talked to.

Robert S Alexander
Glastonbury, Conn

BOOTS, BOOTS, BOOTS

Can a company insist that all workers wear safety equipment? If so, should the company defray part or all of the expense? How would the cost compare with accident-compensation payments?

PEOPLE SEEM to have little or no consideration for their limbs and other parts of their bodies. We go merrily on our way with no safety precautions. The reason? Because each of us feels he is smarter than the other fellow.

The use of safety shoes is one of the long but debatable list of safety measures. The old argument of using old shoes in the shop, and the cost of safety shoes, head the list of reasons why we don't buy such things to protect us from losing our toes.

It is false economy to lose two or three or even four weeks of work because of a crushed toe, and even more unfortunate to lose the toe in the bargain. Whose fault? Probably your own . . . certainly if you were taking any precautions at all, it would not happen.

While it may seem to many of us foolish to purchase safety shoes for the job, the one thing remains—this is what may save you a lot of doctor bills and the loss of employment. One never knows when that very steady rest or piece of equipment will fall on a foot. Many objects have the habit of dropping to the floor or ground at the slightest provocation, or jarring. And if you are in the way and without the steel caps of safety shoes—look out.

It would be a good idea if the company would foot part of the bill. In fact the entire cost could be saved by the company since both the reduction in lost hours of production and the reduced rate of insurance would nearly, if not more than, pay for a pair of shoes for each worker in the shop.

Safety shoes and safety glasses are probably the two most important items in today's battle against man

I've been making tools for wire and ribbon metal forms long enough to know that A. H. Nilson Fourslides are the most adaptable and produce parts most economically. For easy set-up and tool adjustment, accurate feed, and rugged design . . . Nilson Fourslides are my choice.

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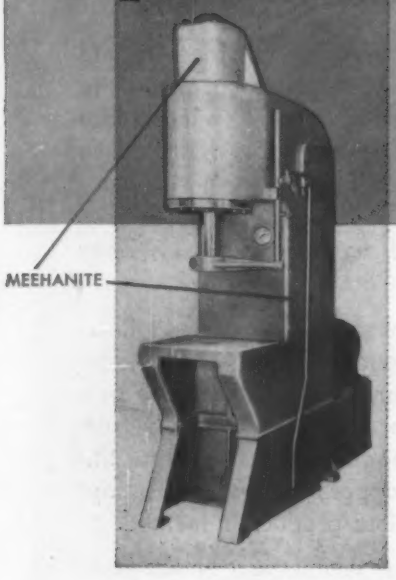
The Greenerd Arbor Press Company, Nashua, New Hampshire, specifies Meehanite metal for many of their important component parts and *all* of their Press cylinders.

These cylinders are cast of Meehanite Type GA (50,000 psi) as well as the top and bottom caps of Presses under 30 tons capacity. The 30-ton Hydraulic Press is of box-type construction and cast of tough, dense Meehanite metal which reduces the vibration to a minimum. The Meehanite cylinder is a separate unit, bored and honed to size.

The 75-ton, four-posted type Hydraulic Press is a rugged machine designed for all-around maintenance and production work. The head and table are also Meehanite castings providing high tensile strength which insures rigidity and uniformity; and, of course, the cylinder is also cast of Meehanite metal.

THE MANUFACTURER SAYS:

"All our cylinders today are Meehanite castings as well as the top and bottom caps of Presses under 30 tons capacity. We also used Meehanite castings for the main frame of our 30-ton Press and on the 75-ton Press, the head and work table are cast of Meehanite metal. Meehanite castings are used for all these parts because we are particularly interested in securing strong, extremely close grain and pressure tight castings."



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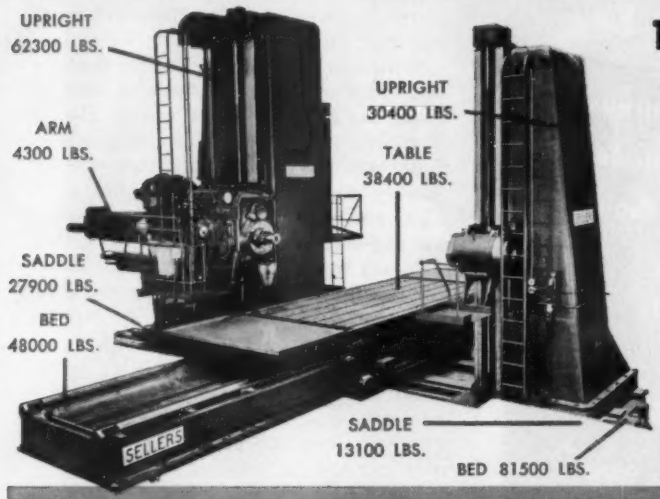
The Goodman Manufacturing Company of Chicago, Illinois, has for years been making surface plates, one of the absolute necessities for answering the present-day requirement for greater precision in machine tool work.

THE MANUFACTURER SAYS:

"Our customers frequently specify the use of Meehanite castings for surface plates because Meehanite metal definitely provides the very fine grain structure and reduced deflection on the surface of a given surface plate for a given load, because of the superior physical characteristics of the material."

Industries report what Meehanite Castings have done for them



154 TONS OF MEEHANITE CASTINGS IN FARREL-BIRMINGHAM'S BIG SELLERS HORIZONTAL

A new Sellers, 8-inch, planer-type, horizontal boring, drilling and milling machine, built by Consolidated Machine Tool Company, Rochester, New York, has been installed in the Ansonia, Connecticut, plant of Farrel-Birmingham Company, Inc.

Meehanite castings from 27 different patterns were produced for this huge horizontal, ranging from a few pounds to 40½ tons. The more than 154 tons of Meehanite metal probably make over 90 per cent of the entire weight of this machine.

THE MANUFACTURER SAYS:

"We have long recognized the value of Meehanite metal's soundness and guaranteed physical properties to meet specific requirements. In this Sellers horizontal, for example, the heavy proportioning of the uprights and the superior vibration-damping qualities of Meehanite metal combine to practically eliminate deflection. The 96-inch x 204-inch table is likewise factored to resist sag under loads up to a maximum of 70 tons, thus permitting machining operations within extremely close tolerances.

In this case, as in thousands of other heavy machines and machine tools built with Meehanite castings under exacting controls from materials procurement to finished product, a highly satisfactory answer to our needs is being provided by Meehanite metal."

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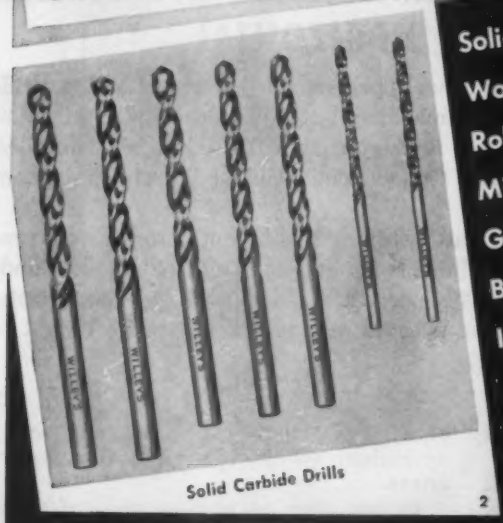
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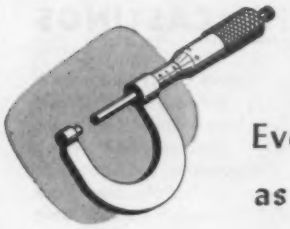

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And smart gear users know
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made to *your* specifications.

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"Gears... Good Gears Only"

THE CINCINNATI GEAR CO. • CINCINNATI 27, OHIO

destroying himself piece by piece. Oh, sure, you can collect insurance for the eye, or the toe, or the finger, but unless you want to be a blind man, or run around on 8 toes and 7 fingers . . . don't take chances. Don't try to be smart, use common sense and stay all in one piece.

A worker today must realize that he is part of a great industrial machine, the greatest in the world. He is a little cog, but one of the most important. Without him the machinery stops, the country's economy slips, and everyone—including this one cog—suffers.

To say no to safety precautions is like waving a red flag at the bull. You may get away with it, but chances are that sometime—bango—you're hooked.

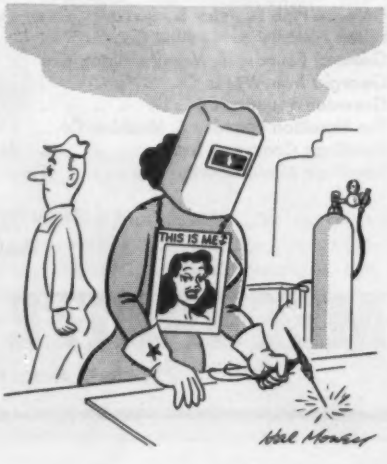
Individualism is important to maintain, but use it in other ways where it does not personally affect your chances of staying whole and in one piece. Use your right to vote. Don't try to be smarter than your next door neighbor, and find yourself ending up on crutches.

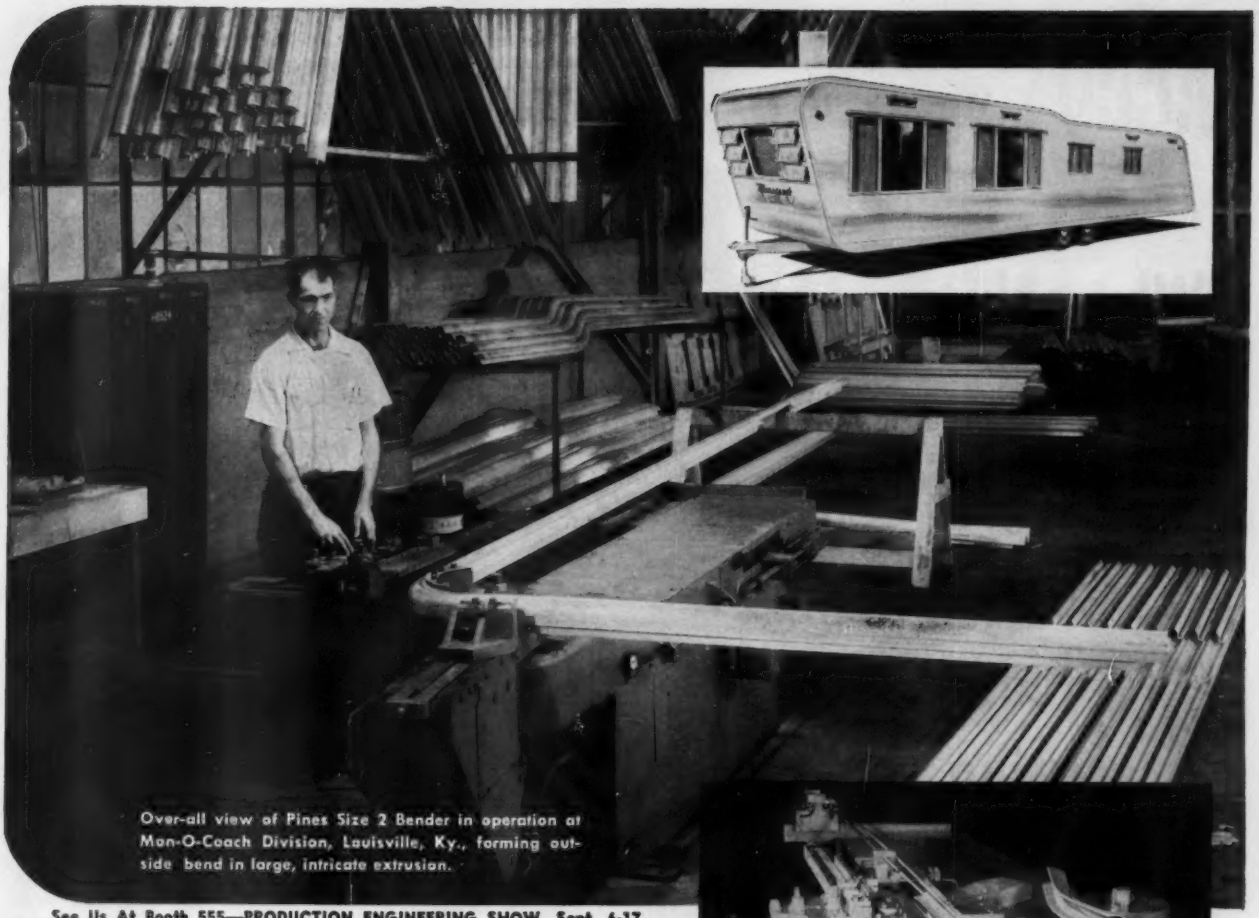
Many companies today are insisting on their employees wearing safety shoes and safety glasses. Not because they are trying to take away rights of the worker, but because they are trying to protect the most valuable part of the great industrial machine of our times—the combined human race working for improved standards of living.

As foreman you should also follow the lead and wear safety shoes. Put the program over. Have the safest department in the company and get your share of praise from top management.

Edna Waugh Townsend
West Hartford, Conn

OBVIOUSLY, no company has the right to insist that all workers wear safety shoes, any more than they have the





Over-all view of Pines Size 2 Bender in operation at Mon-O-Coach Division, Louisville, Ky., forming outside bend in large, intricate extrusion.

See Us At Booth 555—PRODUCTION ENGINEERING SHOW, Sept. 6-17.

PRODUCTION BENDING ALUMINUM EXTRUSIONS THE "PINES-WAY"

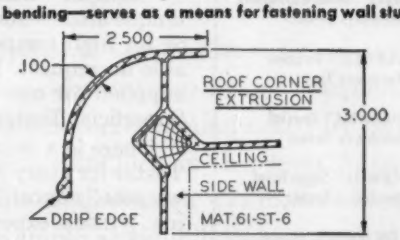
The new, luxurious Mon-O-Coach Mobile Home, manufactured by Mon-O-Coach Division, Ironwood Trailer Coaches, Inc., Louisville, Ky., is a marvel in modern metals engineering. It features all-aluminum structural members which are now cold formed and shaped accurately by production bending methods. Previously, many of the bends were formed by slitting and hand-bending a section, then re-joining the slotted section by welding. Today, a Pines Size 2 Production Bender handles these jobs fast and efficiently.

Slitting and Welding Operations Eliminated

All curved sections are now cold formed in a single operation, including an offset bend in an opposite plane in one of the most ingenious extrusions probably ever developed for the automotive industry. Shown in drawing, this large unique extrusion, incorporating a ⅝" wood section, is a top corner section which serves as a means of fastening top, sides, and front panel members together. Tooling by Pines forms neat, smooth bends without excessive distortion or wrinkling, completing the piece with the wood section in place. Previous slitting and welding operations are eliminated.

▲ View of tooling for making offset bend in opposite direction. Two plug-type mandrels support inner walls. Smooth, neat bends are formed at a bending arm speed of 6.0 r.p.m.

▼ Cross-section of Mon-O-Coach's intricate, top corner extrusion. Hollow center incorporates ⅝" wood section installed before bending—serves as a means for fastening wall studdings.



Write FOR MORE DATA

If you would like more data on production bending of aluminum extrusions the "Pines-Way", write for free copies of "Pines News". Or ask for a Pines engineer to call and assist you with any production problem.

PINES ENGINEERING CO., INC.

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• Only with the high degree of accuracy built into a WILSON "Brale" Diamond Penetrator can you meet the requirements of a hardness test where one point of hardness represents a depth of only 0.00008".

These sphero-conical penetrators are made from carefully selected diamonds, ground to mathematical precision with microscopic accuracy and standardized on test blocks in the WILSON Laboratory. Each is proof-tested under heavy load.

Special "Brale" Penetrators for testing unique areas—such as the pitch line of gears, or for high temperature testing—are available on request. N "Brale" Penetrators are supplied for use with WILSON "Rockwell"* Superficial Testers.

There is a WILSON "Rockwell" Hardness Tester for every requirement—including the WILSON "TUKON" for micro-indentation testing. WILSON experts are available to consult on hardness testing requirements. Write or call today.

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right to insist that their employees wear a certain type of work shirt. But they can suggest—and Murphy will do as a "horrible example"—that for their own sake it might be wise to wear safety shoes. If they back up the suggestion by offering to pay all or part of the cost, I am willing to bet that at least ninety per cent of the work force will be wearing this type of shoe in a matter of months. The remaining ten per cent will be composed of the diehards who cling to the belief that what they wear is entirely their own business; also quite a few who are physically unable to wear this type because of foot trouble, and, of course, the office force who do not have shop hazards to contend with.

Suppose a company decides to stress the safety-shoe angle without making an effort to defray any of the expense to the worker? Well, frankly, I don't think they will get very far; for the same reason that our friend Ed cited. That is, that the average worker does not make a point of buying shoes exclusively for work. I am referring to the factory worker, especially in the machine shop fields. Of course, the farmer and construction worker are in another category. From a long experience in machine shops, the facts are as Ed stated; the shop worker's shoes have undergone quite a lot of outside wear before they are relegated to the shop.

For economic reasons they make the transition from Sunday best to "good enough for work" in anything from a year to eighteen months. I say economic reasons advisedly, because the average family man does not feel financially able to buy two pairs of shoes exclusively for work in a year, which is the average life of shoes exposed to oil, coolant, chips

"No wonder you're having trouble . . . that's just the original print . . . here are the revisions."

ANOTHER EXAMPLE of
REDUCING COSTS WITH—

Buhr ECONOMATION

Mills, core-drills, drills, countersinks and individual-lead-screw taps 206 intake manifolds an hour gross!

Economy and auto*mation* are combined in this Special to form another example of the way Buhr *Economation* reduces production costs for leading manufacturers.

This 6-way dial-type hydraulic-feed Buhr Special is equipped with a 72″-diameter 8-position automatic index table, complete with shot bolt.

Chip disposal is accomplished by an automatic rotating chip conveyor, attached to index.

Operations formerly accomplished by eight machines were combined in this Buhr Special —and volume of production was increased! . . . A typical example of Buhr Economation!

Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

See what Buhr Economation can do to reduce your production costs. A phone call, wire or letter will bring you a prompt consultation with one of our top sales executives.

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ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers

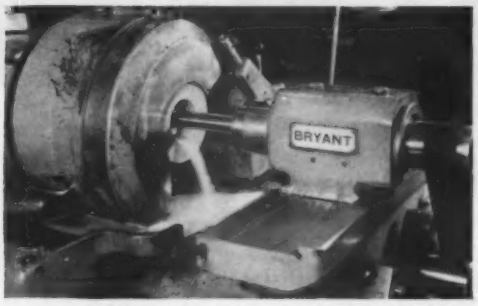
Courtesy of Brown & Sharpe

W+B INDUSTRIAL LUBRICANTS

PACING THE INDUSTRY IN METALWORKING LUBRICANTS

Out of the W & B Labs. have streamed a long succession of metalworking lubricants: transparent grinding and cutting coolants . . . paste-form and fluid-type water solubles . . . concentrated bases to blend and fortify metalworking lubricants . . . oils for critical grinding, honing . . . and dozens of others. You see, for more than 60 years W & B has stuck to its own particular last . . . developing lubricants to keep production and quality high, operating costs low, successfully, too.

Ask any top machine operator.



Courtesy of Bryant Chucking Grinder

Take W & B Grinding Concentrate 1500. This transparent water-soluble lubricant for grinding ferrous metals is used as thin as 200 to 1. Yet it keeps grinding wheels unusually open, settles chips almost instantly, stays virtually foam-free—is very economical.

Do *you* have a grinding or machine problem? Ask us, without obligation, to send a W & B Technical Representative. He'll be glad to help you. Simply use coupon below.

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and all the ills that shoes worn in the machine shop are heir to.

So, I suggest that any company that feels sold on the idea of safety shoes for the shopman might study the economic aspect from the worker's point of view and come up with a plan that will ease the strain on his pocketbook. First, they could furnish safety shoes as they furnish perishable tools. Second, defray part of the cost of safety shoes.

In some large concerns employees pledge a certain amount to various charities, deductible in weekly amounts from the pay envelope. Why not use the same method in supplying the worker with shoes that will protect him from the everyday foot hazards of the shop?

Robert S Alexander
Glastonbury, Conn

Names in the News . . .

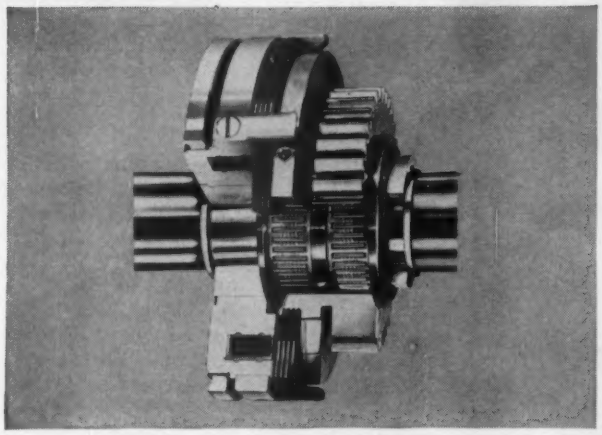
Kenneth R Cowan, formerly associated with Tammen & Dennison, Inc, Chicago, has been named plant manager of Aetna Ball & Roller Bearing Co, Chicago

Emery B Kerekes, former executive of Loewy-Hydropress, Inc, has been named chief engineer and a member of the executive committee of Allstates Engineering Co, Trenton, NJ. **N Bruce Bagger,** formerly assistant director of the NAM, has been appointed sales promotion and market analyst.

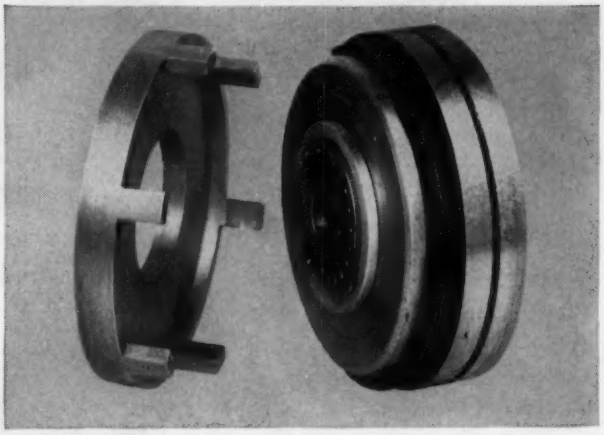
Taft-Peirce Manufacturing Co, Woonsocket, RI, promotes: **Roy W Winn,** Midwestern air gage sales engineer, to district manager of the Detroit sales office; **K Thomas Bryant,** sales engineer, to assist him; and **F Curtis Fales** to replace Mr Winn.

I-T-E ELECTRO CLUTCH—unit assemblies now available in American Standard dimensions

Two different designs—slip them right on your present shafts



1. Low inertia "H" design. Most of weight concentrated in center. Both drive and driven shafts are splined to key with clutch body and laminations respectively.



2. External drive "C" design. Magnet body serves as power take-off by means of flanged coupling or integral gear. Splined shaft is continuous through clutch center.

Here's good news for machine designers. Now you can order I-T-E Electro Clutches in unit assembly designs. Simply specify the clutch sizes you need, and the shaft dimensions taken from your own drawings.

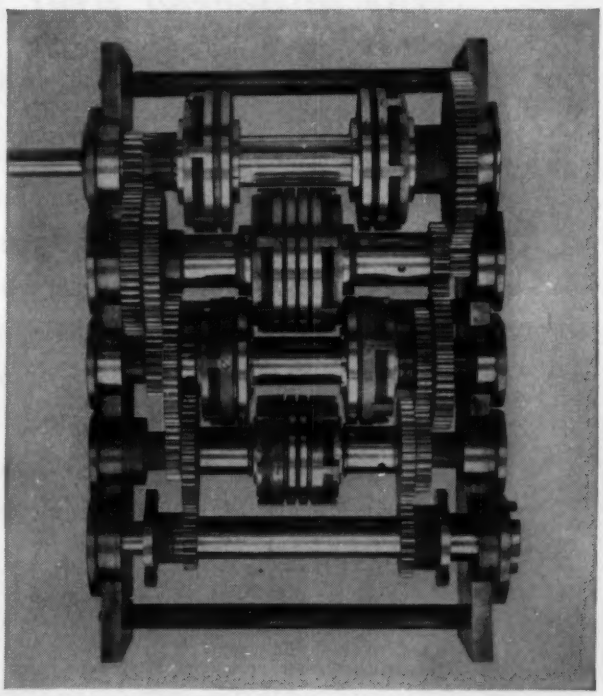
WHY I-T-E ELECTRO CLUTCHES?

Of highest torque rating for their size, compact I-T-E Electro Clutches fit right into the transmission box and operate under oily conditions. 24 volt supply is safe, operates with inexpensive telephone type relays. No friction linings to replace. In fact the clutching surfaces need *no maintenance of any kind.* They are self-adjusting—no change in torque rating during life of clutch.

SOLVES SKILLED OPERATOR SHORTAGE

Machines equipped with I-T-E Electro Clutches can produce more because feed and speed changes can be made instantly just by turning knobs or pushing buttons. With automatic programming, optimum production speeds can be predetermined and preset. Tamperproof cover prevents unauthorized changes.

Write for illustrated bulletin. I-T-E Circuit Breaker Company, Transformer and Rectifier Division, 19th & Hamilton Sts., Phila. 30, Pa.



CLUTCHES GO IN TRANSMISSION BOX This typical arrangement shows a 16-speed unit drive. Note how compactly eight I-T-E Electro Clutches fit into this small space. Clutches are available in ratings from 3.2 to 45,000 ft. lb. running torque.

I-T-E CIRCUIT BREAKER COMPANY Transformer & Rectifier Division

. . . the preferred dial indicators

TIME-TESTED FOR ACCURACY AND DEPENDABLE PERFORMANCE!

For more than half a century, industry has relied on Ames indicators for help in the solution of measurement problems of all kinds. And through the years, Ames indicators have done their jobs superlatively well. The Ames reputation for extreme accuracy, ruggedness and reliability through many millions of cycles is due to an unswerving dedication to our original guiding principle—to make the best possible indicators and gauges, through constant research and the use of highest quality materials and expert craftsmanship.

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MANUFACTURER OF MICROMETER DIAL GAUGES • MICROMETER DIAL INDICATORS

Alfred C Ryan, formerly general manager of the Buffalo Division of Houdaille-Hershey Corp, has been elected president of F Jos Lamb Co, Detroit designer and manufacturer of automation equipment and special machinery. **John K Rye,** general manager, has been named, in addition, vice president.

Wallace T Gray, formerly manager RCA's Camden, NJ, plant, has been appointed general works manager of Leece-Neville Co, Cleveland manufacturer of small electric motors.

James T Ferri, vice president of F F Slocomb Corp, Wilmington, Del, specialist in machinery, engineering, and fabricating, has been elected president of the firm.

Sidney G Young has been named sales manager for Lewis Rolls Dept, Blaw-Knox Co, succeeding **Glen McDowell.**

Charles F Trapp, Jr, formerly area sales manager for Westinghouse Electric Corp's Apparatus Div, has been appointed sales manager of Formsprag Co, Van Dyke, Mich.

R F Edgar, Midwest regional manager for Warner Electric Brake & Clutch Co, Beloit, Wis, has been appointed industrial sales manager.

R H Gathman, executive assistant to the general factory manager of all Fisher Body stamping plants, has been named manager of the new plant to be built at Mansfield, Ohio.

William E Horenburger, formerly associated with Thomson Industries, Manhasset, NY, has been named sales manager of Aetna Ball & Roller Bearing Co, a division of Parkersburg-Aetna Corp, Chicago.

Pressco Casting & Mfg Corp, Chesterton, Ind, appointments: **Carl E Rowe,** production manager, to vice president, manufacturing; and **William J Brinkman,** to vice president, engineering.

E C Benzing, Jr, field engineer for The Bellows Co, Akron, Ohio, manufacturer of controlled-airpower work devices, has been made Chicago district manager.

The right file for the job plus the right service to make it count

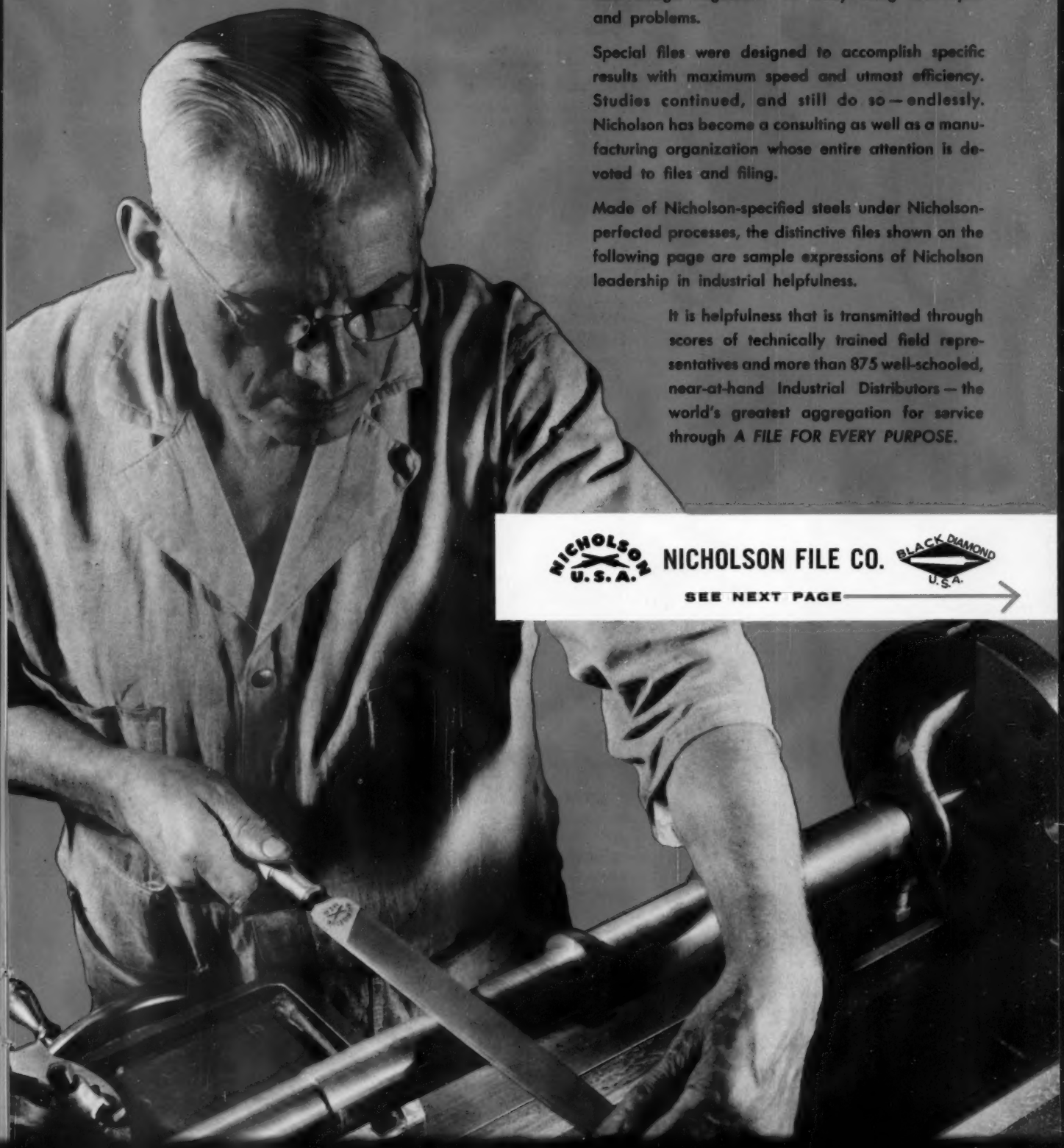
When industry was younger, it gave less thought to files and filing. One file often did many jobs. Time, labor, types of material, character of operations, rejects and other filing-production factors were seldom calculated with today's close eye to costs.

Nicholson long ago recognized the growing importance of these cost factors in modern shop practices. Into the metallurgical laboratories, machine and tool shops, and assembly plants, went Nicholson research and design engineers — to study filing techniques and problems.

Special files were designed to accomplish specific results with maximum speed and utmost efficiency. Studies continued, and still do so — endlessly. Nicholson has become a consulting as well as a manufacturing organization whose entire attention is devoted to files and filing.

Made of Nicholson-specified steels under Nicholson-perfected processes, the distinctive files shown on the following page are sample expressions of Nicholson leadership in industrial helpfulness.

It is helpfulness that is transmitted through scores of technically trained field representatives and more than 875 well-schooled, near-at-hand Industrial Distributors — the world's greatest aggregation for service through *A FILE FOR EVERY PURPOSE.*



NICHOLSON U.S.A. **NICHOLSON FILE CO.** BLACK DIAMOND U.S.A.

SEE NEXT PAGE →

See your Industrial Distributor for truly helpful service in choosing and using the right file for the job

ALUMINUM "A" *(left)*
Special teeth cut fast, finish well, avoid clogging

STAINLESS STEEL *(right)*
Has exceptional wearing properties for this tough metal

FOUNDRY *(left)*
Extra-sturdy teeth for rough work like snagging castings

LONG-ANGLE LATHE *(right)*
Gives cleaner shearing and clearing than ordinary files

BRASS *(left)*
Sharp, long-angle teeth eliminate grooving and clogging

SWISS PATTERN *(right)*
Precise filing of dies, patterns, etc., in many types and cuts

SHEAR TOOTH *(left)*
Cuts fast and smooth; ideal for soft metals, plastics, wood

SUPER-SHEAR *(right)*
Smooths as it removes metal—practically two files in one

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Smoke out the Bugs

from your surface grinding operations

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- BENDING and STRAIGHTENING MACHINES
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FABRICATING TOOL CATALOG No. 9

Just completed, this catalog illustrates and describes the various types of Cleveland machines used in the fabrication of plates, bars, angles, beams, girders and other structural shapes.

Should you desire additional information on any of the machines you'll find in this book, we'll gladly furnish you with it promptly.

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Here you'll find a description of the Cleveland System of Standardization which allows you to use economical standard rather than costly special punches. Its outline of the proper care of punches and dies will help reduce your replacement cost. It lists and illustrates all standard and special Cleveland Punches and Dies available for every make of punching machine and press. AA-577

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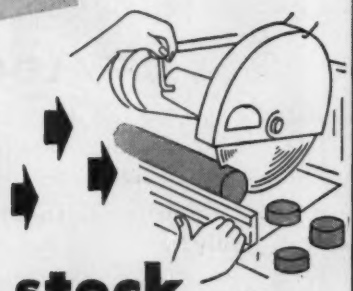

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carbide bar stock cut to length

Now you can buy super hard **Talide Bar Stock** in bars, strips or rods; in standardized sizes from 1/16" square to ¼" x ¾" rectangular; tubes 1/16" to ⅜" O. D.; rods 1/16" to ½" diameter . . . IN ANY LENGTH. Complete stocks are available at these warehouses:

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Metal Carbides stocks 1325 different sizes of standard, solid Talide Metal in bars, strips, rods, tubes, bushings, rings, flats, tips and discs for immediate shipment. Special shapes furnished up to 25" O.D. in any length and up to 5000 lbs. per piece by weight —for every die and wear part application.

● Metal Carbides produces only top quality metal in latest type vacuum furnaces. From ore to finished product, all operations are rigidly controlled in our new multi-million dollar plant of over 100,000 sq. ft. Write for Catalog 55-G. Metal Carbides Corporation, Youngstown 7, Ohio.

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METAL CARBIDES CORPORATION
MC
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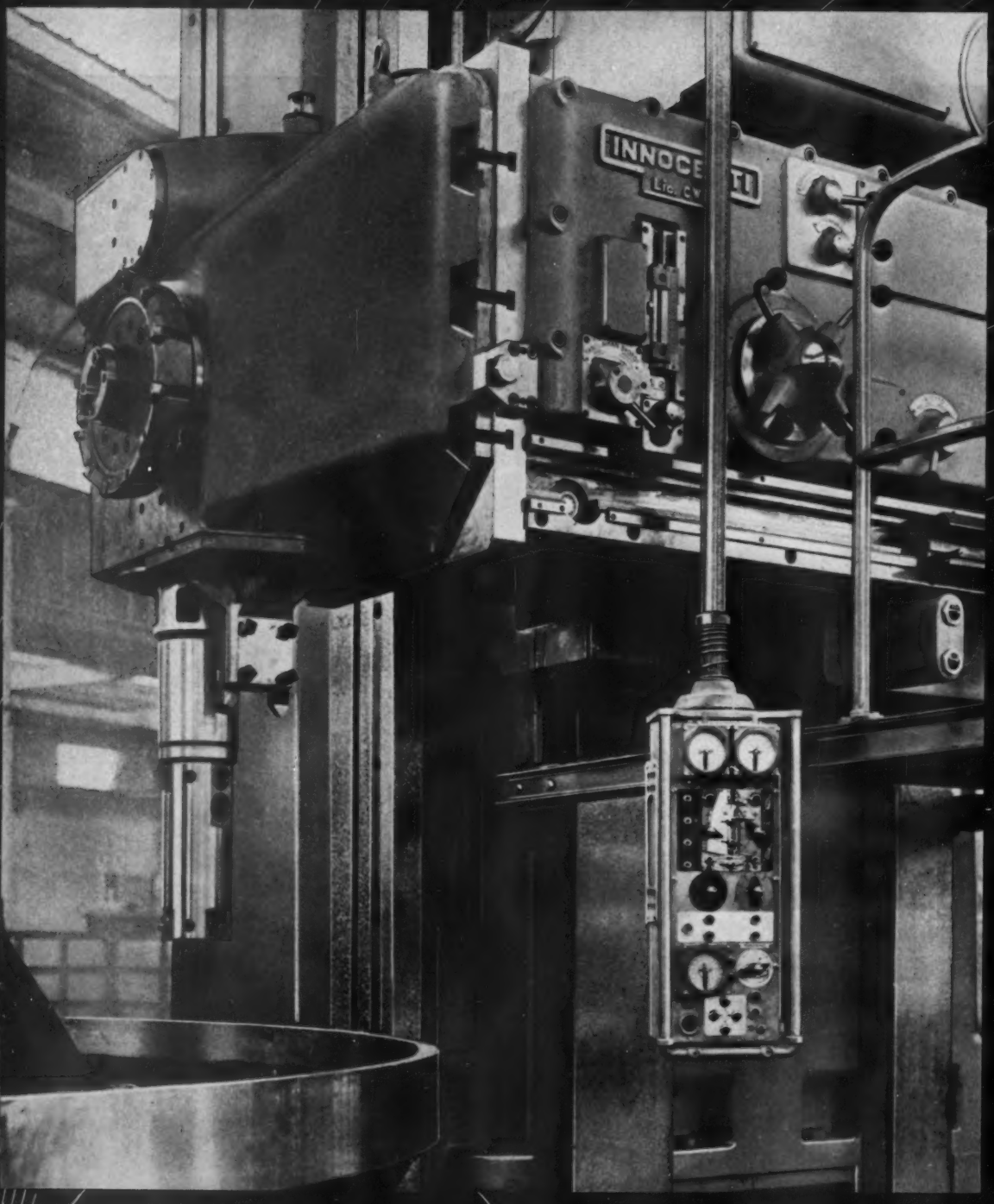
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



This machine is equipped with a special head, allowing boring and milling operations in the vertical or horizontal planes without changing the head or further accessories. This head allows also, by means of a tool-holder, turning and surfacing operations, owing to the automatic transversal feed of the headstock of the

MILLING AND BORING MACHINE

INNOCENTI - C.W.B.

INNOCENTI

Lic. CWB

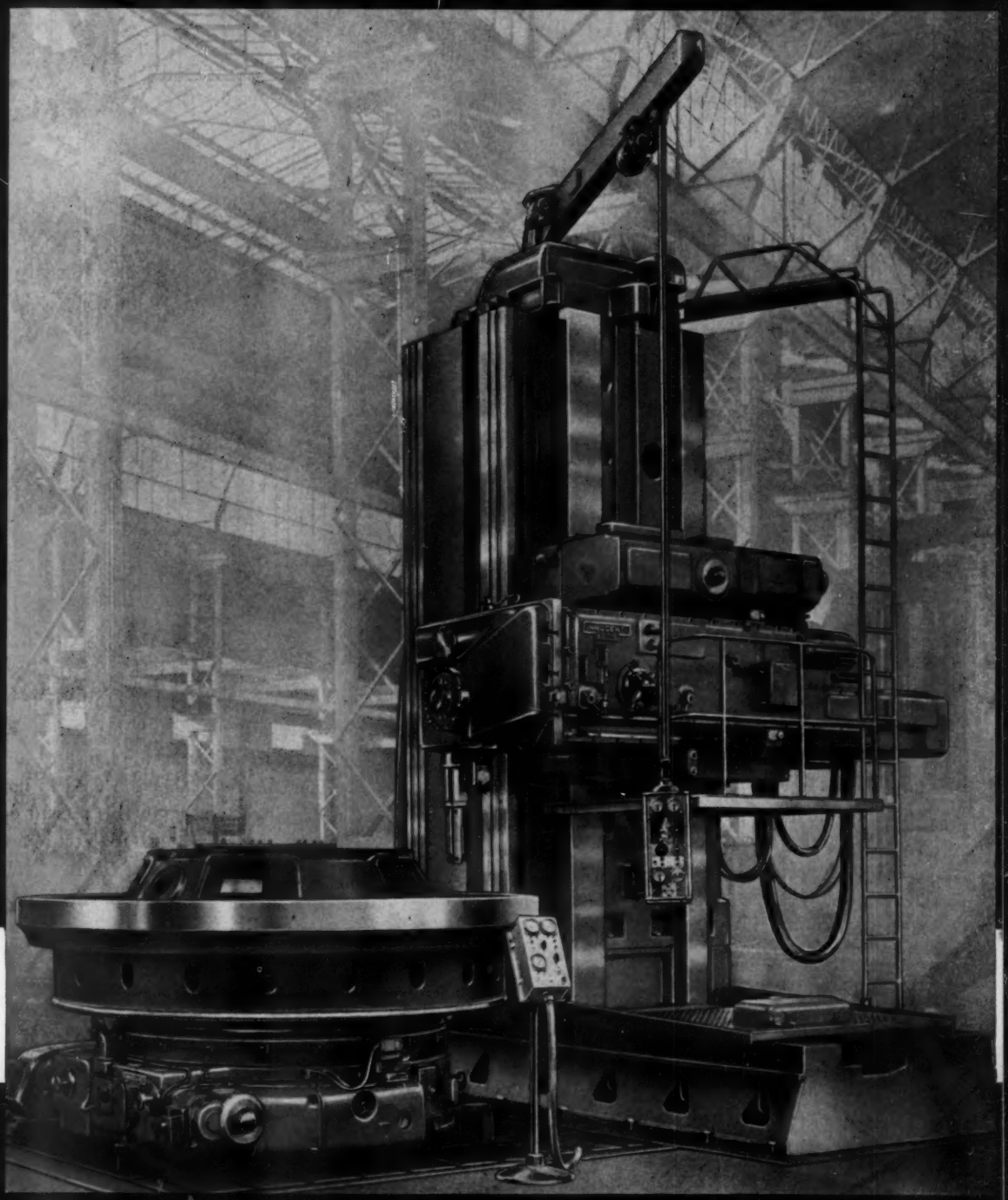
Turning, surfacing and boring

of the pivots of a Francis turbine, all these operations being done in one setting on a

MILLING AND BORING MACHINE - INNOCENTI - C.W.B.

Type FAFT 204-147,5

Power available at the milling cutter or at the boring bar: 40 HP



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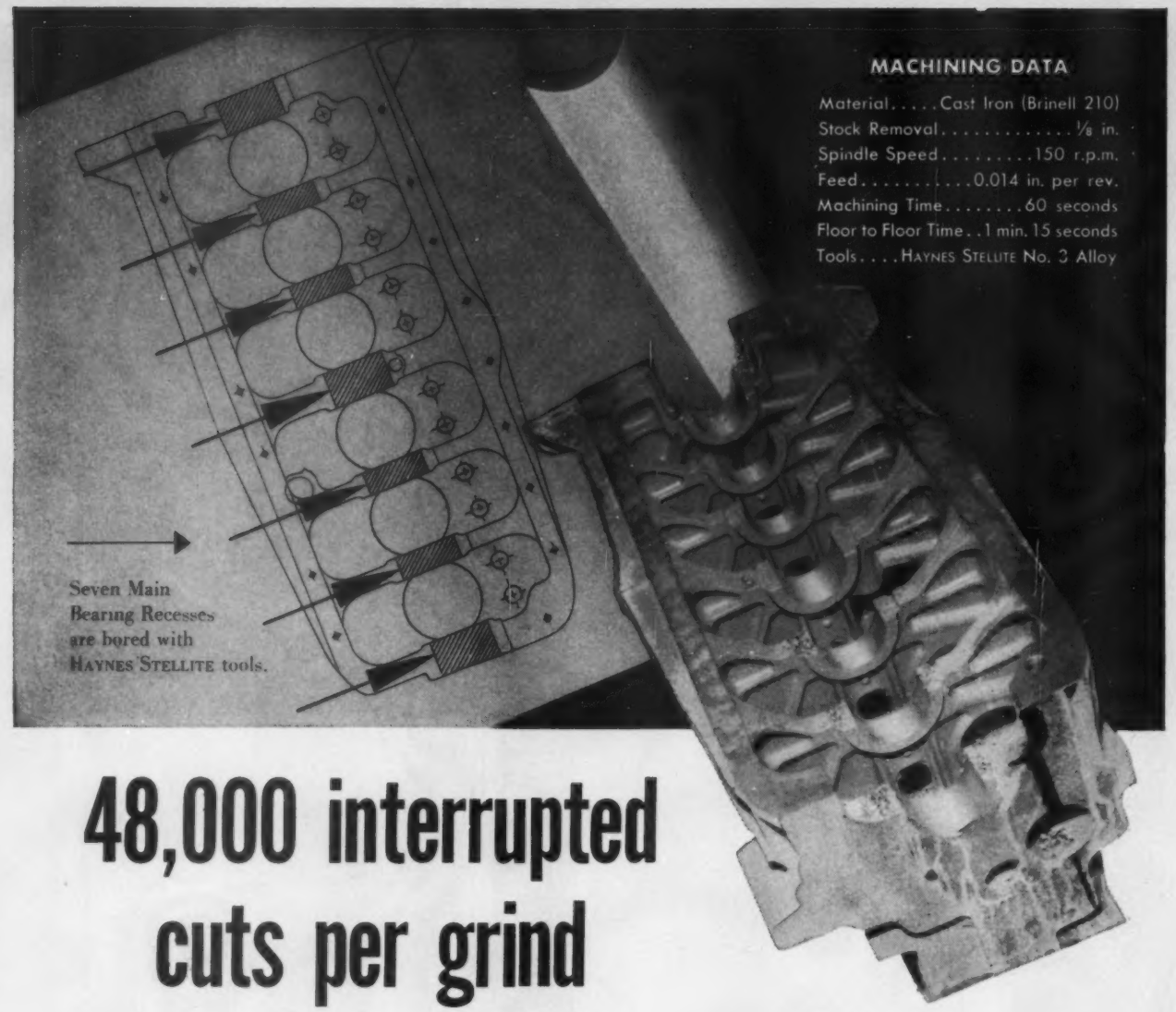
MACHINING DATA
Material.....Cast Iron (Brinell 210)
Stock Removal.....⅛ in.
Spindle Speed.....150 r.p.m.
Feed.....0.014 in. per rev.
Machining Time.....60 seconds
Floor to Floor Time..1 min. 15 seconds
Tools....Haynes Stellite No. 3 Alloy
Seven Main Bearing Recesses are bored with Haynes Stellite tools.

48,000 interrupted cuts per grind

Haynes Stellite tools machine the main bearing recesses in 320 cast iron engine blocks between grinds. Each of 14 tools used in the set-up makes 150 interrupted cuts in each block . . . a total of 48,000 interrupted cuts per grind. The tools remain in operation for a full eight-hour shift, without chipping or spalling. Other tools tested on this job chipped under the constant hammering of the intermittent cuts, and had to be replaced in less than an hour.

Standard tool bits ⅜ in. square and 2 in. long, made of Haynes Stellite alloy No. 3, are used for this operation. Only 0.015 in. of metal has to be removed when the tools are sharpened, and the tools can be reground about 30 times. Then, when they are too short to be used for boring the main bearings, they are used to machine the smaller cam bearing recesses. In this second operation the same tools can be reground about 50 times more!

There are four grades of Haynes Stellite metal-cutting tools varying in hardness, compressive strength, and impact resistance. For a complete description of properties, sizes, and recommended operating data, write for the free booklet, "Haynes Stellite Metal-Cutting Tools."

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

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DISSTON has the edge . . .

DISSTON NO. 360 HACK SAW FRAME

in hack saw blades

for power and hand use

No wonder the great new Disston hack saw blades are being acclaimed the finest ever made! They cut faster, cleaner, straighter. They take maximum feed pressure without shattering, meet the toughest production demands. They give longer cutting "mileage" for your hack saw dollar.

Try Disston hack saw blades on a guaranteed NO-RISK basis! We believe they will out-perform any others you can buy and will give you a percentage rebate if you receive less service from Disston blades than from those you now use. Judge for yourself as other cost-conscious producers have . . . that Disston hack saw blades have the edge and hold it!

Your Disston Distributor has these rugged blades in stock. Call him today.

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3. **Di-Mol Machine Blades**—All-purpose, high-speed steel blades recommended for cutting tool steels, machine steels, cast iron, and for general machine shop production.
4. **High-Speed-Steel Hand Blades**—Outstanding blades for hand-cutting stainless steel, chrome-nickel alloys.
5. **Di-Mol Hand Blades**—Rugged blades, recommended for general machine shop production cutting.
6. **Duraflex Hand Blades**—Have hard tooth edges and tough, flexible backs for general cutting.
7. **Chromol Hand Blades**—All hard blades for satisfactory cutting in general maintenance and repair use.

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DISSTON FILES for every industrial use

You'll like the way Disston files speed your filing operations and give smoother finishes. And you'll appreciate the longer life of a Disston. There's a type for filing everything from large castings to the smallest, most intricate shapes.

Disston Bite-Rite® American Pattern Files

Just watch the way a Bite-Rite takes a firm hold, cuts level and smooth at each stroke, bites off long, curled shavings—and you'll see why it's the first choice of men who work with metals. Bite-Rite files have an exclusive staggered tooth pattern and open gullets for fast, smooth, clog-free cutting.

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These are precision tools for close-tolerance filing—favorites with tool and die makers, machinists. Accurate, long-lasting Superfines are made in a wide selection of sizes and cuts for filing irregular shapes, for bench and parallel machine filing.

Your Disston Distributor is always available with expert advice and information, has a full line of Disston products in stock to meet your needs and an organization to fill them with speed and efficiency. On Bite-Rite files, for example, he can supply you with a helpful chart to make selection easy.

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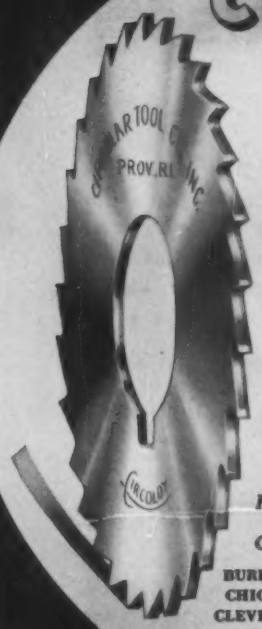
DISSTON HAS THE EDGE

Only CIRCLE R makes

CIRCOLOY Saws



Circoloy Saws do jobs too tough for HSS, not tough enough for carbide — let you restrict use of carbide and HSS to purposes they serve best. With longer life, longer production runs, superior cutting they outperform HSS by a wide margin. Recommended both for increased regular production and particularly for automation, where sustained precision performance is indispensable.

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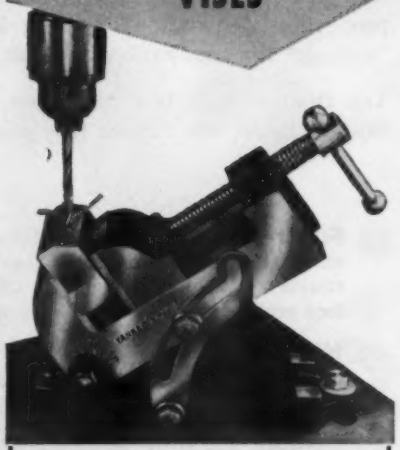
Jig in a Jiffy

"YANKEE" ANGLE VISES



Easily converted to fast-acting, economical jig. Shortcuts costs on small jobs. Lock the work in the "Yankee" Angle Vise. Tilt for the angle and lock. You're set up for every operation . . . hand or machine. Also available with quick-release swivel base. Two jaw widths . . . 2" and 2¾". Each vise supplied with grooved "V" Block for holding rounds.

"Yankee" Ratchet Tap Wrenches for tight spots . . .

Ratchet needs only slight back and forth movement. Adjustable cross-bar for close-quarter work. R.H., L.H. and rigid adjustments. Knurled thumb piece for speedy starting in and backing out. Two lengths for 0 to 5/16" taps, one for 0 to 3/16" taps.

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DIVISION OF STANLEY TOOLS

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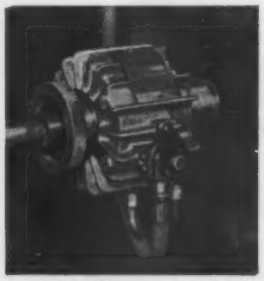

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. . . for most lathes to 1" bar stock capacity

- Hold delicate parts without damage or adjustment
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- No adjusting for stock or part variations
- Finger-tip or foot control eliminates operator fatigue
- Eliminates jarring of head stock

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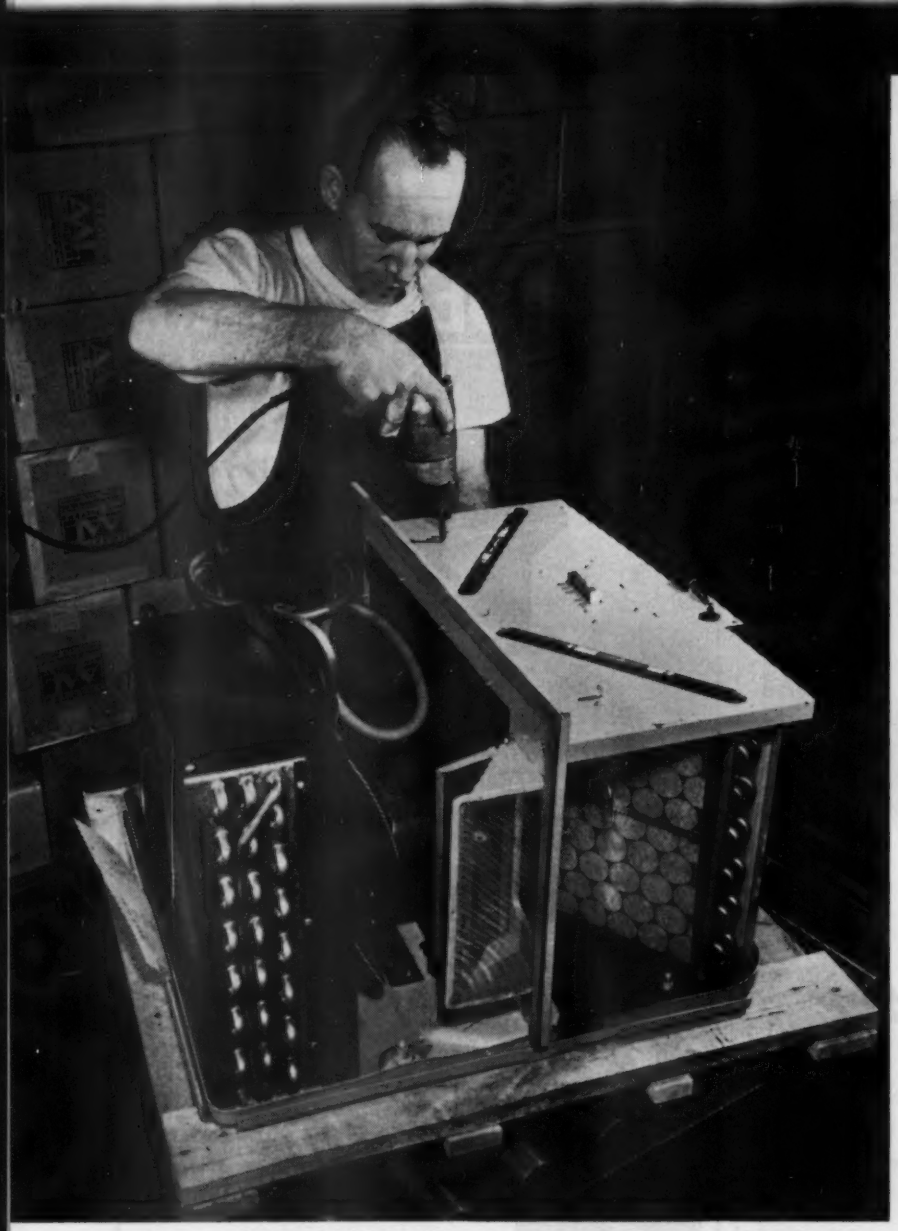
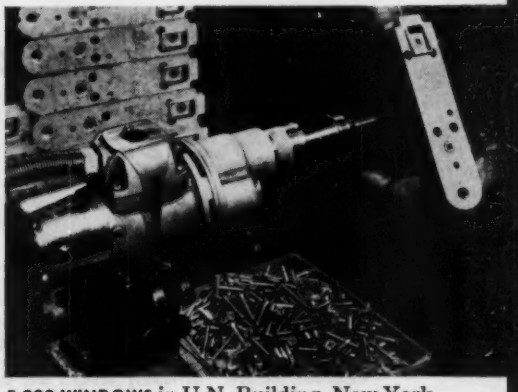


TEN IN THE TOP. 10 Phillips self-tapping screws hold top panel to the frame of the Fedders ¾ ton room air-conditioner. "We found employees on the assembly line are the best salesmen for Phillips screws," says the assistant plant manager. "Rapid driving of the screws is important to them because they are on piecework."

STEADY ON THE STABILIZER. Here is the final assembly of the top cover of a horizontal stabilizer at Republic Aviation. The purchasing agent said, "You can really foul it up with one of those speed guns if it slips out of the screw slot, but the Phillips type head helps to prevent slipping. It holds on to the driver bit much better than the old-type screw."



5,000 WINDOWS in U.N. Building, New York City, have Caldwell clock spring sash balances. "We depend on the worker's adjustment of the Phillips head screw to make the balance function perfectly," says Caldwell's production manager. "We now use two sizes of Phillips recessed-head screws . . . and have speeded assembly. Our power drivers are mounted horizontally, since we discovered the units are easier to move around than the drivers."

NEW DISCOVERIES IN ASSEMBLY

Many manufacturers in many fields are finding Phillips Cross-Recessed-Head Screws lead to better methods and results

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production begins with

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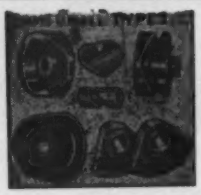

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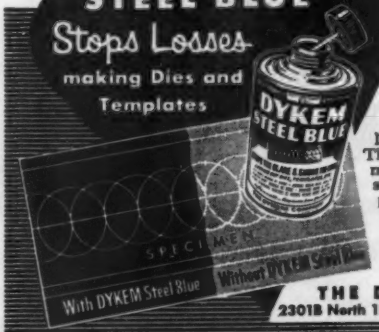
DYKEM STEEL BLUE
Stops Losses making Dies and Templates



Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare.-Increases efficiency and accuracy.

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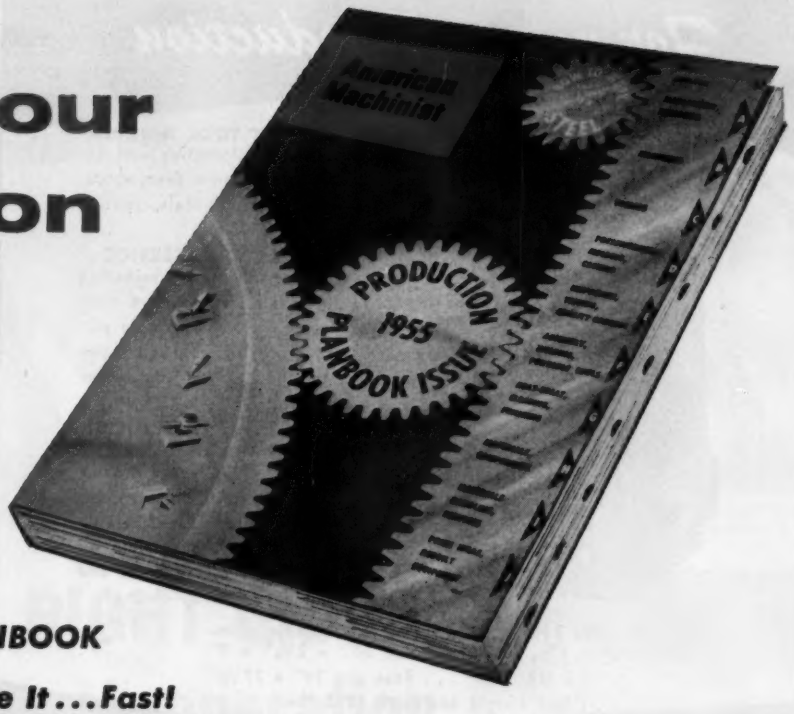
What's Your Production Problem Today?



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The 1955 Production PLANBOOK issue is your most valuable source of *proved* production methods: (1) it brings you in condensed form the best ideas from a full year's issues of *American Machinist*, and (2) this data is classified and indexed so that in seconds you can find the meat of the specific information you want to apply to your problem. Have you checked it lately?

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constant oil flow lubrication Grit seals . . . massive construction . . . adjustable pillow blocks with Timken Taper bearings . . . air flow motor cooling.

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. . . wheel dresser built into tool rest . . . handy coolant control . . . adjustable bearings . . . accessible oil ports . . . all surfaces and sludge pan easily cleaned.

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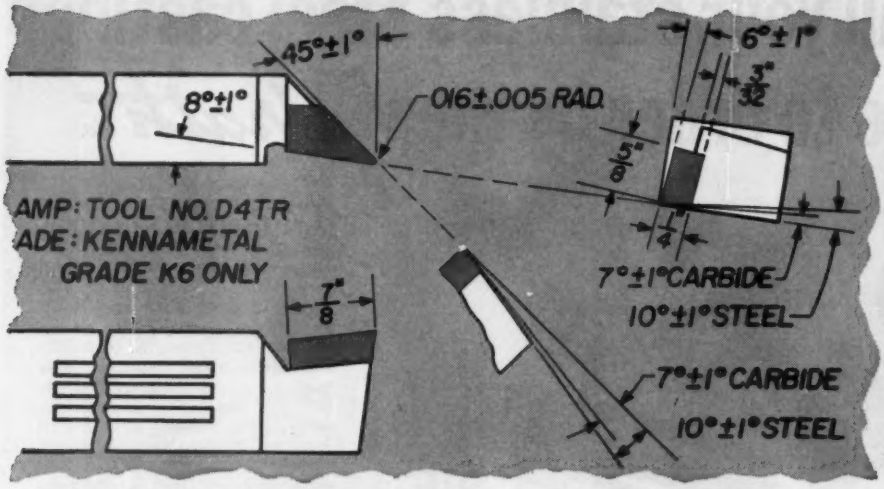
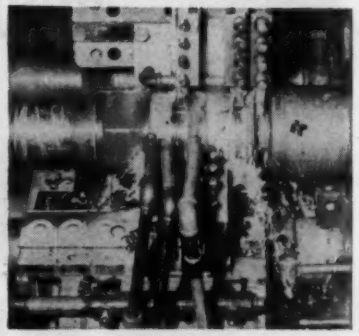
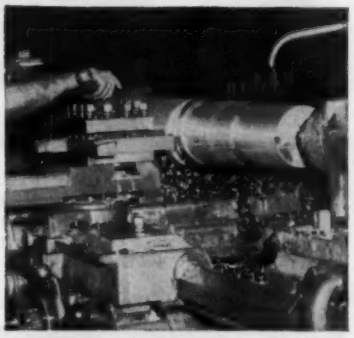


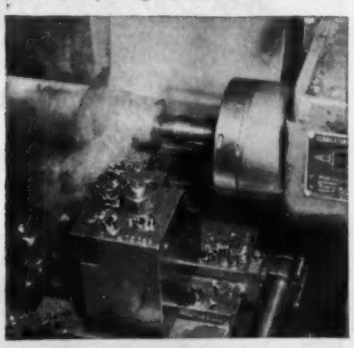
PROVED BEST TEST AFTER TEST



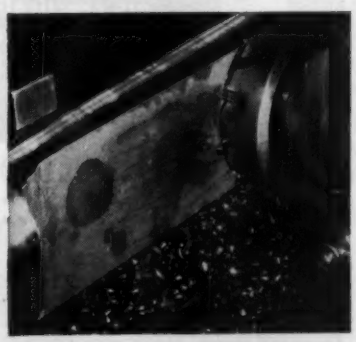
Grade K2S—Rough turning SAE steel housing assemblies reduced from 45 to 18 minutes each.



Grade K2S—Floor to floor time reduced 34% for machining ends of steel drive shafts, requiring 9 passes.



Grade K3H—Kennametal tooling reduces machining time 60% on chrome-nickel-moly bar stock.



Grade K2S—10 times longer cutting life, with 8 times faster speed and feed with Kennamill* milling.

PINPOINT THE RIGHT GRADE of carbide for each operation

when you make up your prints

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How do you get the best?

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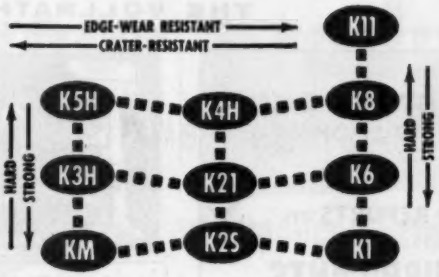
1. The most pieces per grind
2. The longest life per tool or per insert
3. The most consistent *repeat* performance—regrind after regrind or insert after insert.

When you specify Kennametal* tooling, you can depend on top performance . . . consistently . . . from the first run, through each regrind, tool after tool. It helps you forecast performance with assurance because every Kennametal grade has high *reserve* strength . . . the strength needed to stand up to wide variations in materials and machines.



Kennametal helps keep production flowing.

To be sure of the best performance, specify Kennametal. But be specific . . . specify by grade. Once you have the grade pegged for a job, show it on the print . . . added protection that will help you realize dividends through increased production.

A Kennametal Tool Engineer will help you select the *right* grade of Kennametal for each operation. He works exclusively with Kennametal . . . applying and servicing it. His specialized experience could be of great value to you. KENNAMETAL INC., Latrobe, Pa.

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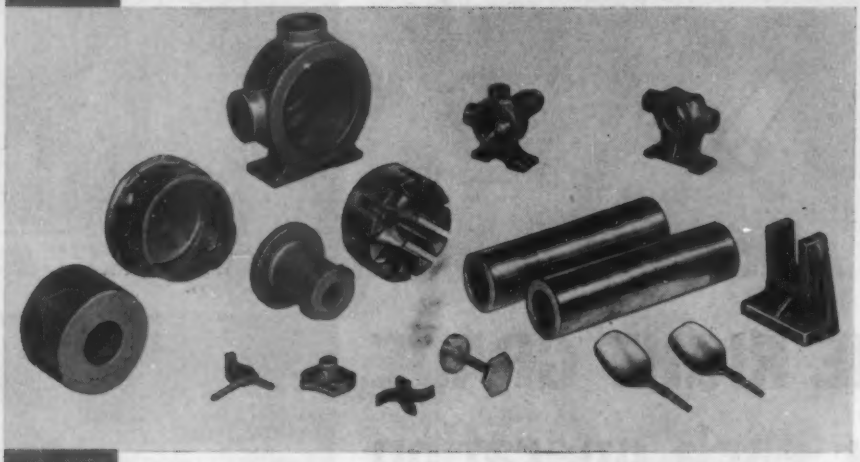

THE skill and experience of 81 years of foundry, finishing and metal-working operations go to work for you when you call on Vollrath. Complete, modern foundry facilities assure dependable delivery of all types of quality stainless steel castings — as well as grey iron and nonferrous castings of aluminum, aluminum alloys, brass and bronze. Shown here are just a few of the many stainless steel castings that can be produced by Vollrath . . . *faster and for less than it costs to make them in your own plant.*

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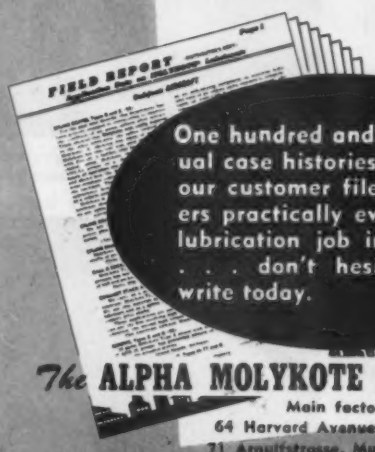

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For full information, call the Century District Sales Office or Authorized Distributor nearest you.

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1 Factory-Finished, precision honed I. D.
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The NEW AMERICAN MACHINIST'S HANDBOOK

Edited by
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Senior Associate Editor, *American Machinist*
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Here's the biggest news in years for machinists, toolmakers, apprentices, designers, engineers, inspectors—in fact *all* in the metal working industry. Now you can have the on-the-job help of an *amazingly improved, fully up-to-date*, NEW AMERICAN MACHINIST'S HANDBOOK.

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The Lead Screw Tapper Spindles of this Natco Three-way Holetapper required machining operations hard to combine without serious distortion.

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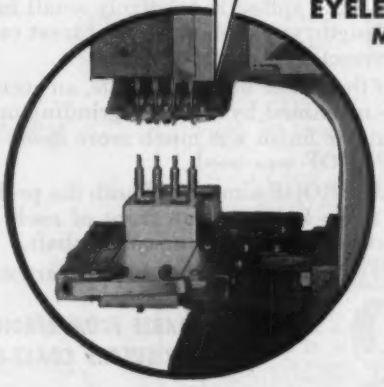

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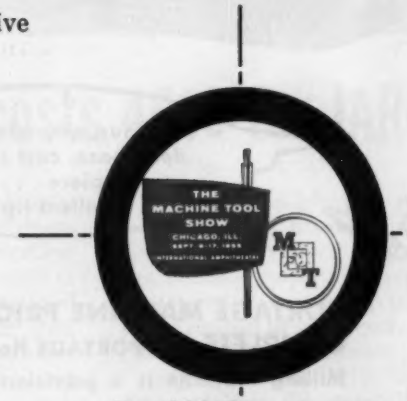

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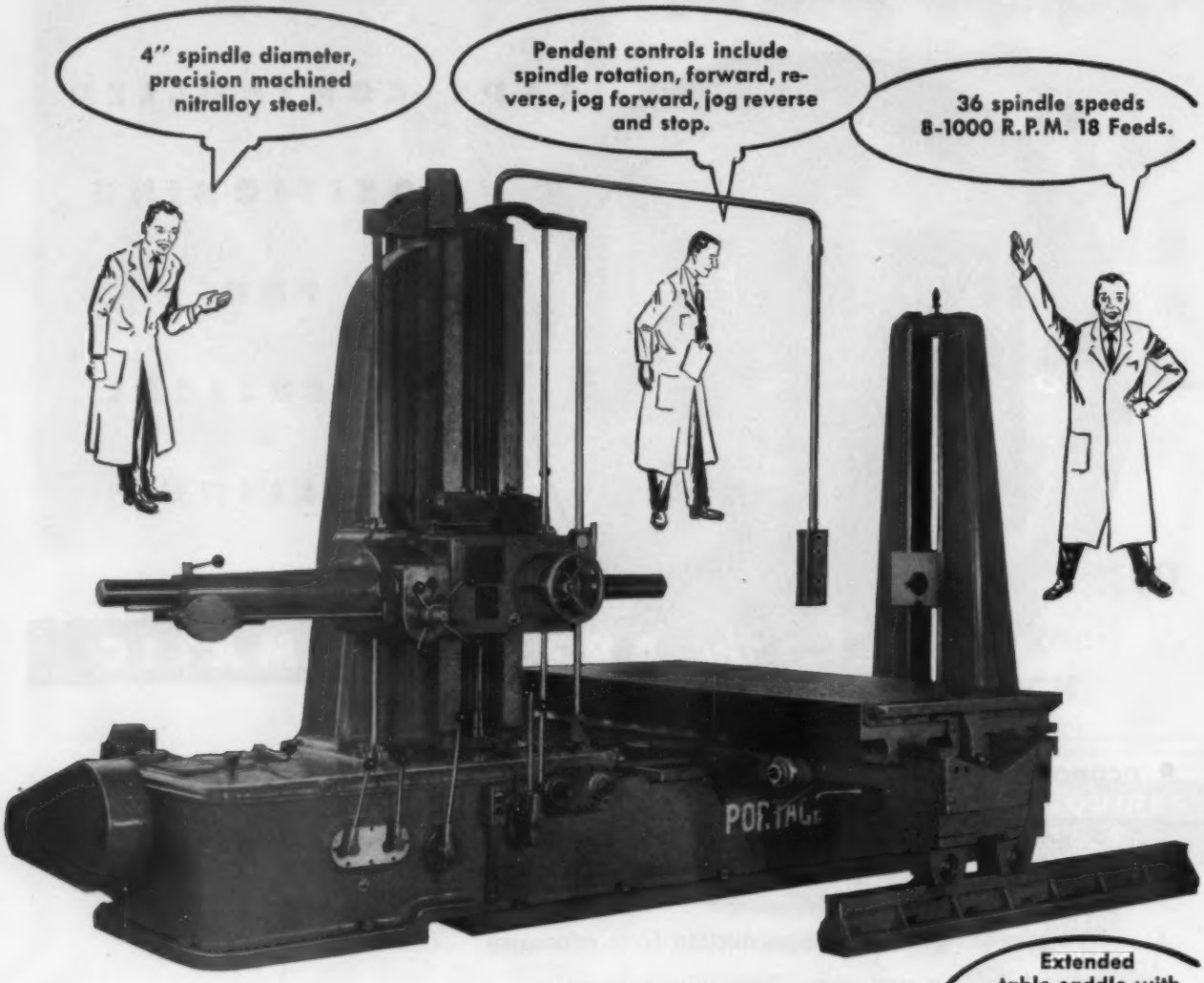
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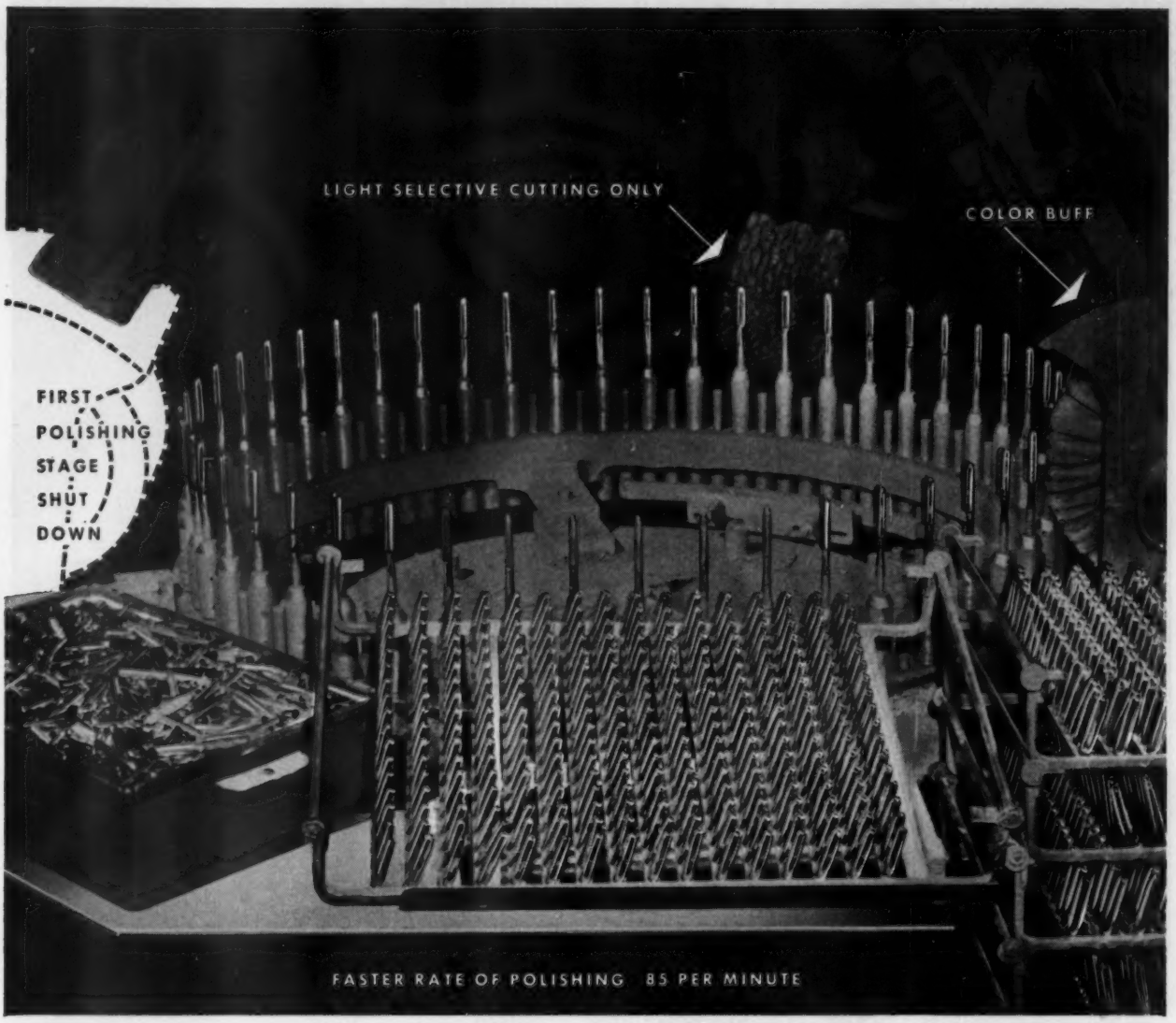

How Formbrite cuts polishing costs 40% for JARCO

Pens, pencils, and lipstick cases have to be attractive to sell—yet they must be able to take a beating in daily use. The Jarco Metal Products Co., which specializes in drawing metal parts for these and such other products as miniature flashlight cases, and similarly formed products, tried Formbrite,® Anaconda's new drawing brass, shortly after it was announced to the trade.

Superior polishing characteristics combined with excellent drawing properties, plus hardness and scratch resistance, sounded ideal for Jarco products. Formbrite has proved an excellent pressroom material. The uniformity of temper from batch to batch eliminated shutdowns for adjustments in their battery of 12-plunger Waterbury-Farrel presses, which can produce up to 500,000 pieces a day.

It's in the polishing room where Formbrite has really paid off. Jarco uses 50- and 98-spindle continuous-loop machines having two cutting stages and a final color buff stage. The first cutting stage is shut down completely. The second stage is used for only a partial or selective cut in certain areas of the cap—because of the extremely deep draw. The color buff stage does most of the work. The savings in polishing run about 40%, according to David Roberts, vice president.

Formbrite is a premium product at a nonpremium price. Find out for yourself how its superfine grain, excellent drawing properties, strength, and scratch resistance can help you make a better product at lower cost. Write for Publication B-39. Better yet, ask about a sample or a trial batch. Write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

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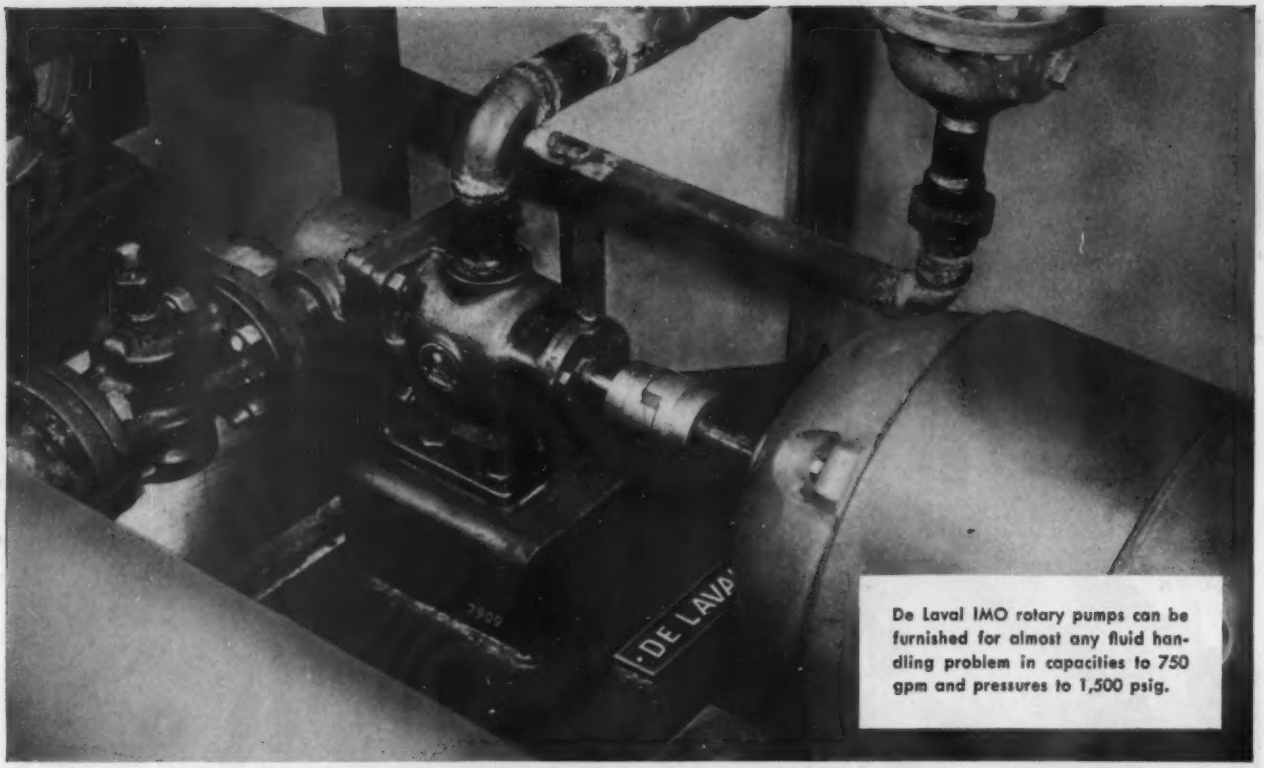


De Laval IMO rotary pumps can be furnished for almost any fluid handling problem in capacities to 750 gpm and pressures to 1,500 psig.

What to Look for in a Rotary Screw Type Pump

By W. J. MONCON, *Assistant Chief Engineer*
De Laval Steam Turbine Company

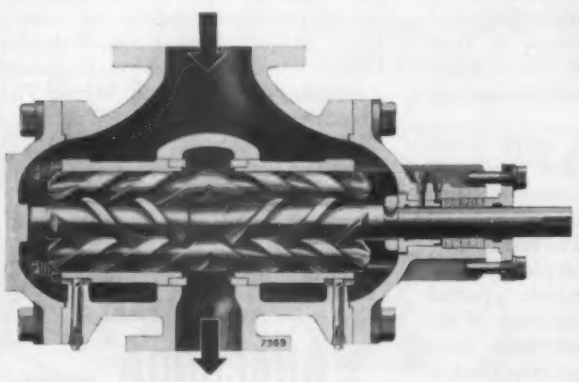
A sound knowledge of design, and how it affects performance, is the best insurance a buyer can have that he will get the pump he needs. This brief analysis of the IMO, a rotary three-screw pump manufactured by the De Laval Steam Turbine Company, will give you some of the necessary facts.

What qualities should you look for in a rotary type pump? It must, of course, meet specified capacities and pressures. But, it must also be efficient, operate quietly, stay on the job.

The axial flow of a screw type pump, and the resulting low inlet losses for any given pump speed, are important benefits that should be considered in making pump selections. The absence of timing gears and other mechanical features of construction also enable the De Laval IMO pump to operate at direct-connected motor and turbine speeds . . . to handle viscous liquids and high suction lifts.

One of the most important features of the IMO pump is the hydraulic turning of the idler or sealing rotors. The central or power rotor is the pumping element; the liquid pumped turns the sealing rotors.

A screw type pump is well suited for applications where pulsation-free flow is desirable. The axial flow of the liquid without trapping and the unique thread form which keeps closures fluid-tight contribute to quiet operation of the IMO pump.



De Laval IMO Series A322A, a positive displacement, rotary screw type pump, can handle capacities to 750 gpm and pressures to 150 psig.

Catalog LS gives useful application and specification data on the IMO pump. An article titled, *Rotary Pumps, Basic Considerations in Their Application*, contains a description of rotary pumps in general. For these publications, write on your company letterhead to De Laval Steam Turbine Company, 887 Nottingham Way, Trenton 2, New Jersey. DL-301

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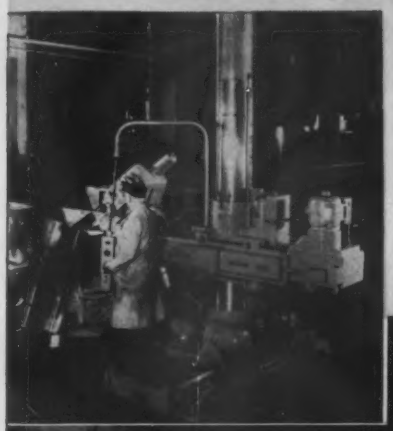
UNIVERSAL RADIAL DRILLING MACHINES



Drilling angular holes in bore of casting is a job that requires accuracy, fast tool positioning and plenty of power to take full advantage of the highest feeds and speeds permissible with modern cutting tools. Kaukauna Universal Radial Drills have the power, accuracy and stamina to do this work quickly, easily and at low cost. A versatile line of machines with simplified controls, they maintain efficient high production on large, unwieldly workpieces or small production parts, and perform drilling, reaming, boring, counterboring, tapping and spot-facing operations. They do jobs that no other machines can do . . . save time and money.

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From the *American Machinist* Library of *Tips for Top Shop Men*

MICROSTRUCTURE, rather than composition, may frequently be the key to successful machining of a part. Two pieces that look alike and were made alike may be entirely different in their reaction to a tool.

Well planned is ONLY half done . . .

make plans pay off with P-K

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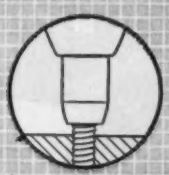
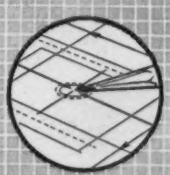
Save cost of tapping and tap equipment

Save cost of "two-side" fastening

Save cost of inserts for machine screws in plastics



Permit extra speed of power and automatic driving



Permit simpler design — fewer fastenings

ASSEMBLY COSTS STAY DOWN WITH

For almost any assembly, you can plan cost-reduction from savings like these and many other advantages of Self-tapping Screws. But the promise of savings can fade in production if screw failure snarls up the line.

That's why quality standards for P-K Self-tapping Screws were set so high to begin with, and are still harder to match today.

Only Parker-Kalon can offer P-K experience —covering many more years and millions more applications than any comparable record.

Only Parker-Kalon can offer P-K quality, the indispensable extra, along with the proved advantages of Self-tapping Screws.

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Big Coulters—lathes with 4-speed headstocks, and return and idle speeds *5 times cutting speeds*. Fast Coulters — threaders with starting and stopping levers within quick reach of the operator, and individual adjustments to both front and rear tool slides.

These hungry Coulters, and machines like them, often replace one, two — sometimes three — older machines. And — because of their advance design — they turn out four times the work at half the cost. Periodic retirement of older machines often spells the difference between a high and a low production figure. It does for SKINNER. Chances are it can for you.

Coulter's booklet "Automatic Threading Lathes" gives you a first-hand standard of comparison between new and old machines—and new and old production methods. A copy is yours for the asking.

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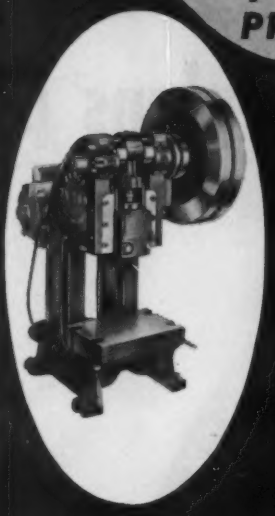

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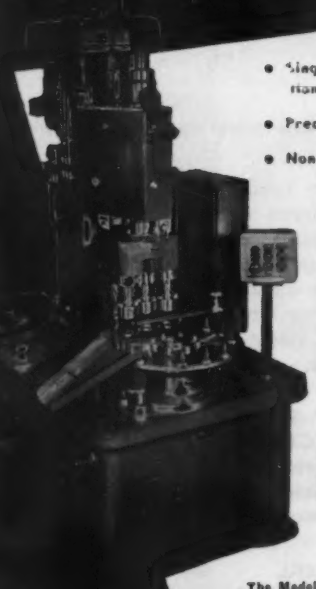

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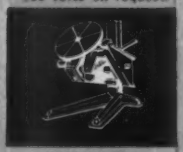

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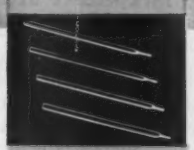

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For mild steel, cast iron, "hard-to-weld" steels, stainless steels, hard surfacing.

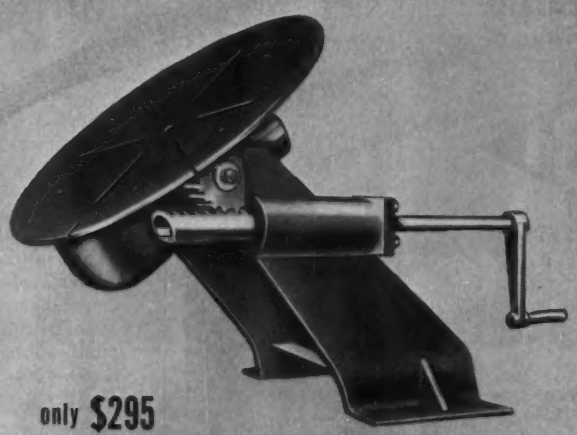
UP-1000 Welding Positioner

A light touch of the hand is all it takes to position weldments up to 1000 pounds positively and quickly with the P&H UP-1000. The welder simply clamps the work piece to the table and adjusts spring tension with the crank. An exclusive feature then keeps the unit in static balance, regardless of whether the piece is rotated through a full 360° or moved horizontally or vertically.

With a light push, the welder guides the piece to the precise angle he wants as the work progresses for economical downhand welding all the way through.

The P&H UP-1000 occupies a floor space of just 22" x 26" and weighs only 200 pounds.

only $395



only $295

WP-1 Welding Positioner

Here's P&H quality in a low-priced, work-hungry positioner that handles weldments up to 500 pounds. Ideal for floor or bench mounting. Gives you full 360° table rotation. Advanced design permits the 24" diameter table to tilt 135° from horizontal without weldment striking the positioner — makes it a cinch to reach ordinarily troublesome places. Tilting crank has spring-lock indexing — you set it and it stays.

Electronically-controlled, motor-driven turntable also available — to provide stepped up production.

Manual unit easily portable — weighs only 100 pounds. Stands 15⅞" high with table in horizontal position. Optional equipment includes pedestal for floor mounting at slight additional charge.

P&H Announces the UP-1000 and WP-1

Two new P&H Welding Positioners so reasonably priced that no plant can afford to be without them

Now, with these two new P&H units, economical downhand welding is within the range of every small plant or department. And for the first time, low-cost, positioned work is practical, even on the smallest weldments.

With these two units, you consistently turn out better, faster, lower-cost work because you weld straight through in the downhand position. You end wasted motion, constant repositioning of the piece. You use larger, hotter electrodes to deposit metal up to *twice as fast*. And you make stronger, better-looking welds, too — welds that help add sales appeal to your product.

Whatever you weld, you're ahead with one or both of these low-priced P&H cost-cutters. Put them to work for you and watch productivity increase, costs drop. Order now from your nearby P&H distributor or write P&H Welding Division, Harnischfeger Corporation, 4514 W. National Avenue, Milwaukee 46, Wisconsin.

3028

HARNISCHFEGER

the P&H Line

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING COMPANY LTD., 455 King Street West • Toronto, Ontario, Canada

MILLING MACHINE ARBORS, ADAPTERS, ARBOR SPACERS AND BEARINGS

Hardened and ground to high standards of accuracy and quality.

These products are built by long established, reputable West German manufacturers, and tested for performance to American standards. Immediate delivery from New York City stock at low competitive prices.

Also available:

- *Multi purpose vises*
- *Tapping attachments*
- *Lathe mandrels*
- *"Wille-Grip" keyless drill chucks*
- *Large variety of machine tools*

MBI

QUICK CHANGE CHUCKS & COLLETS

All parts hardened and ground. Simplicity of construction insures trouble-free operation.

Our headquarters in New York City

Write for complete details and prices to Dept. 303

M.B.I. EXPORT & IMPORT LTD.

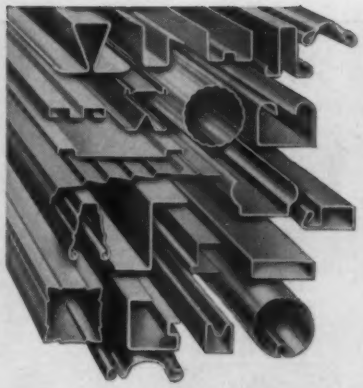
A Division of Machinery Builders Inc.

475 Grand Concourse, Bronx 51, N. Y.

"Over 20 years experience in designing and building machinery"

CABLE ADDRESS: Machbuild New York

Phone: MOtt Haven 5-0900



cold roll forming

FOR THE

GROWING BUSINESS

● As your business grows, new opportunities arise for drastic cost reduction by cold roll forming. For instance, you can make plain structural angles, channels, etc., up to ½" thick . . . light, strong, finely finished, at a substantial saving . . . You can form wide sheets and panels into cabinets for refrigerators, ironers, radio-TV sets, etc. . . . You can make nearly all components for metal buildings, including trusses, studs, joists, siding, roofing, windows, doors, mouldings, etc.

You can do perforating, notching, embossing, curving, coiling, etc., of the roll formed shapes, at no extra labor cost, by inexpensive extra tooling or attachments to the roll forming machine.

The Yoder Book on Cold Roll Forming illustrates and describes these versatile machines, typical end uses of roll formed shapes, how they reduce cost and increase production. A copy is yours for the asking.

THE YODER COMPANY

5519 Walworth Avenue, Cleveland 2, Ohio

Save your large JIG BORERS for large jobs . . . put small precision work on the LINLEY . . .

The Linley Jig Borer provides the means . . . at very low cost . . . of handling your most exacting requirements in precision. With it you can cut costs through having a tool exactly fitted to your small work . . . save your larger machines for larger work.

Specifications

Table Movement: 6" x 10" **Table Size: 7" x 17½"**

Send for complete information TODAY!

LINLEY BROTHERS CO.

664 STATE ST. EXT., BRIDGEPORT 1, CONN.

Looking for a Stainless Steel with a *New* combination of properties?

Here is a radically different chrome-nickel stainless developed by Carpenter to give you this unusual combination of fabricating and product benefits . . .

. . . work hardens *much slower* than any of the conventional 18-8 grades

. . . remains *non-magnetic* after severe cold working

. . . possesses corrosion resistance *equal to* or *better than* standard chrome-nickel stainless steels

This unusual combination of advantages is one reason why Carpenter *Stainless No. 10* is earning a unique place among engineered materials.

For example, it has opened whole new fields of applications in the fastener industry. With its slower work-hardening, fastener manufacturers can now produce on automatic machines severely cold headed and upset chrome-nickel stainless parts without process annealing. *No. 10* is also proving its economy on other jobs involving difficult coining, extrusion and swaging operations.

Another example is instrument parts which must remain non-magnetic after fabrication. After a 50% reduction, with a field of 200 Oersteds, permeability is about 1.002. After an 80% reduction: about 1.018. Will you be *next* to benefit from *Stainless No. 10?* How can *your* stainless product be improved, production simplified, costs lowered? Get the complete story on *No. 10.* Just drop us a line on your Company letterhead.

Carpenter STEEL — **Stainless No. 10**

take the problems out of production.

Pioneering in Improved Tool, Alloy and Stainless Steels Through Continuing Research
THE CARPENTER STEEL CO., 109 W. Bern St., Reading, Pa.
Export Department: The Carpenter Steel Co., Port Washington, N.Y.—"CARSTEELCO"

Can be adapted to gage

SPHERICAL BORES

A comparatively simple modification of standard Comtorplug design adapts it for this use. STATE YOUR PROBLEM.

COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from ⅛" to 8" dia.

Unique Advantages

- Positive gaging accuracy to fraction of .0001" regardless of who operates it.
- Indicates actual size, a fixed—not passing—reading.
- Positive 2-point gaging—automatic centering.
- Shallow holes, deep holes, inside splines, open-end holes gaged easily.
- Detects ovality, bell mouth, barrel shape.
- Reaches to bottom of blind holes.
- Gages work while still held in chuck.
- A shop tool for all-day every day use.
- Portable — no wires, hoses or stands.

Investigate the gage used by the thousands in jet engine, automotive transmission, household appliance, farm machinery, guided missile and other volume-precision plants. IT MAKES PRECISION GAGING EASY . . . at machine . . . at inspection bench . . . for selective assembly. No other like it—investigate and see why.

COMTOR COMPANY
68 Farwell St.
WALTHAM 54, MASS.

GET THE FACTS—REQUEST BULLETIN 48

KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseater, assure the user of accurate, time saving work.
Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

WHEN PROFIT TOLERANCES ARE CLOSE

DEMAND the U. S. VERTICAL MILLING MACHINE

. . . for fast, accurate production

The U. S. Vertical Milling Machine is designed to speed work, assure precision milling. Its heavier knee and table, wider saddle and increased bearing surfaces provide the rigidity absolutely necessary for close work. Its accuracy is certified.*

New giant-sized micrometer dials are easy-to-read, simplify close tolerance milling. Three head feeds, one power and two hand, provide the needed versatility for any type cut.

Write for full specifications and detailed descriptive literature.

***Certified Accuracy—Check list showing results of actual tests accompanies each machine.**

new features

- New*giant-size Dials
- Massive knee saddle and table
- Increased weight and strength

POWER HEAD

- Feed infinitely variable from .002" to .008" per revolution.
- Feed rate may be varied while in operation
- Completely enclosed hard chrome plated quill
- Coarse and fine hand feeds as well as power feed
- Quill travel – 5½"

SPECIFICATIONS:

Table size	10" x 36" or 10" x 42"
Longitudinal Feed	24" or 30"
Cross Feed	11"
Knee Travel	16½"
Dovetail Depth	1¼" x 1½"
Vertical Screw	1⅜" dia.
Weight	approx. 1 ton
Table Power Feed	0"—12" per min. (infinitely variable)

For complete information, write

THE U. S. BURKE MACHINE TOOL DIVISION

6 Brotherton Road Cincinnati 27, Ohio

THE **U★S★Burke** MACHINE TOOL DIVISION

Positive action of BARRETT TYPHOON CENTRIFUGAL WASHERS provides for quick, thorough parts cleansing

In these efficient centrifugal machines the washing solution enters the top of the whirling load under valve control. The operating principle—being that of a typhoon—gives the washing solution a spraying, swirling, and surging action which thoroughly permeates the contents. During this action, centrifugal force creates hydrostatic pressure within the basket. That proportion of the deluge going to the bottom is forced up the side and out carrying off the contaminated fluid.

A thorough, quick cleaning is definitely assured by flowing sequence. Two or more liquids may follow, making it possible to wash, rinse or provide any further treatment as required.

Several Barrett installations involve the use of four machines operated by one man who loads and unloads in three minute cycles. Washing time is only one minute. Another type of set-up provides for recovering oil, washing, drying, and coating with rust-proofing material.

As in all Barrett Centrifugal machines, provision is made for convenience and safety of operation.

Send at once for details of Barrett Typhoon Washer

Barrett Centrifugal Washer —made in capacities from 13 to 38 cu. ft. per hour. Each size, depending on condition, will perform at the rate of 20 duty cycles per hour.

THE LEON J. BARRETT COMPANY. 1800 Grafton Road **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

Need a really accurate collet chuck? Before you buy **COMPARE** the new **HANCOCK** Ball-Bearing **CHUKOLLET** with any collet holder.

COMPARE for accuracy!
COMPARE for versatility!
COMPARE for gripping power!
COMPARE set-up time!
COMPARE price!

No collet chuck is as versatile, can grip as tightly or as accurately as the new Chukollet. Can be used on any machine in the shop.

No other collet chuck has an adjustable stop for positive axial location to .0005 inch! 5C collet is not drawn in while closing.

See for yourself. Make a test in your own shop next time you have a job that demands the ultimate in axial and radial accuracy. Remember, Chukollet is guaranteed. Money refunded in 30 days if not completely satisfied! Send for literature today.

Manufacturers' agents and dealers, several territories available.

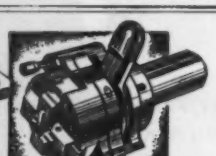
HANCOCK MFG. CO.
Santa Clara, Calif.

Abrasive Cent-R-Lap Tool

Saves time, eliminates diamond dressing. Cones changed in seconds. Available in 2 sizes, 3/8" and 3/4" Cent-R-Laps and abrasive cones in leading grits. Write for descriptive literature and prices.

J. R. REICH MANUFACTURING CO.
45 E. Stroop Rd. Dayton 9, Ohio

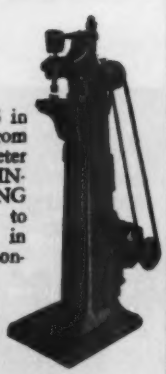
H&G Insert Chaser DIE HEADS



famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Pacific Coast Rep: *A. C. Berhringer, Inc., 334 N. San Pedro St., Los Angeles, Calif.* Canada: *F. F. Barber Machinery Co., Toronto, Can.*

GRANT



RIVETERS — PIONEERS in their line—head rivets from smallest to 3/4" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Sillimen Ave., Bridgeport, Conn., U. S. A.

Loosens FROZEN PARTS FAST!

Handy
Won't
Leak
Shoots
3 Feet

Same formula as famous Kroil that has pleased 14,000 industrial users for 10 years or more.

Loosens stuck together metal parts, bushings, bearings, bolts, screws, pipe, etc., "anything from an embalmer's needle to a bulldozer," one customer said.

"Like an extra employee," said another. "Turned rust into mush, put $50,000 equipment back to work."

You too can get these results.

Try Aerokroil at our risk. Send $2 cash, and we'll pay postage.

KANO LABS. 1068 S. Thompson Lane Nashville 11, Tenn.

12-OZ. CAN $2.
F.O.B. NASHVILLE
CASE OF 12 $18.75

M&M NEW HYDRAULIC KEYSEATER

In this new M & M Keyseater hydraulic action produces exceptionally smooth performance. Cutter stroke and feed are automatically controlled, tool relief is also automatic. High degree of accuracy is assured. Rugged construction features based on excellent design guarantee long life. Available in two sizes, 7000 or 9500 pounds working pull, with 12" and 15" keyway lengths. Larger capacity machines are being designed . . . available soon. Write for specification folder. 90

MITTS & MERRILL

104 Holden Street • SAGINAW, MICHIGAN

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant | **Civil Service Opportunities** | **Employment Agencies**
Positions Wanted | **Selling Opportunities Wanted** | **Employment Services**
Part Time Work | **Selling Opportunities Offered** | **Labor Bureaus**

RATES

DISPLAYED

The advertising rate is $16.65 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

Subject to Agency Commission.

UNDISPLAYED

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

Send NEW ADS to AMERICAN MACHINIST, 330 W. 42nd St., N. Y. 36, N. Y. for Sept. 26th issue closing Sept. 12th

REPLIES (Box No.) Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

Machine Shop Assistant needed by medium sized heavy process machinery manufacturer. Young college engineer graduate with some experience preferred. Position has a future. First duties will cover rate setting, carbide tool development and assist in increasing productivity. Company has liberal profit sharing plan. Salary open. Location S.E. Penna. Reply P 7616, American Machinist.

EMPLOYMENT SERVICE

Salaried Positions, $5,000 to $35,000. We offer the original personal employment service (established 45 years.) Procedure of highest ethical standard is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 652 Brisbane Bldg., Buffalo 3, N. Y.

SELLING OPPORTUNITY WANTED

Wanted—Manufacturer of small tools and light machinery wants new items to increase sales volume. Have 3000 active distributors on present line. Established over 30 years. Reply RA-7465, American Machinist.

EARN $1000 MONTH AS TOOL, DIE DESIGNER

Tool and die designers are *in demand*—and Acme is the *only* school in America offering complete tool and die design training—Acme graduates step right into responsible, high-paying positions. NOW you can take the same course taught in our resident schools by CORRESPONDENCE in your spare time. Training made sure and easy through our famous Cope System. If you can finish high school, you can master this profession! Prepare for a career in an $8000-$15000 yearly salary bracket—write today to ACME SCHOOL OF DIE DESIGN, Corres. Div. A, 8 N. Jefferson Street, Dayton 2, Ohio. *Approved under PL550 for Korean Veterans training.*

MACHINE SHOP SUPT.

START TO $900 MONTH

Southern Mich. mfr. of engines—750 employees —200 in M.S. Dept.—Co. is Tops.

RAY EDWARDS & ASSOCIATES
28 E. Jackson—Chgo 4 Ill—Webster 9-2905

CAN MANUFACTURER WANTS

an experienced man capable of supervising and operating automatic high speed—sanitary can lines. Excellent opportunity for a good man to assure himself of a permanent job with a good future. Salary open. Call or write to:

ATLAS CAN CORPORATION
50th St. & 1st Ave. B'klyn 32, N.Y.
STerling 8-1040

CLASSIFIED **SEARCHLIGHT SECTION** ADVERTISING

BUSINESS OPPORTUNITIES — EQUIPMENT - USED or RESALE

UNDISPLAYED RATE:

$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:

The advertising rate is $12.60 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

Send NEW ADVERTISEMENTS to N. Y. Office, 330 W. 42nd St., N. Y. 36, N. Y. for Sept. 26th issue closing Sept. 12th

Here are a few of the more than 2000 Machines Currently in Stock . . .

AUTOMATICS

9/16" Cleveland, m.d.
⅞" Cleveland Model B, belt
No. 6C Potter & Johnston, m.d.
14" Fay Flanders Type, m.d.
No. 8A Cleveland, m.d., 8" cap., latest
Model B—1-1/16" Cleveland, m.d.
Model A—1⅝" Cleveland Single Spindle, late
4 spindle 1⅜" Cleveland Model M, m.d.
No. 5 DELX Potter & Johnston, m.d., late
No. 6 DRELX Potter & Johnston, m.d., later type
2½" Cleveland, m.d., Model A
2" Cleveland Model A, single spindle, m.d.

BOLT THREADERS

Victor Nut Facing Machine, m.d., cap. ⅜" to 2" Nuts
1" Landis Double Spindle, m.d. thru gear box
1½" Landis 2 spindle, late
1½" Landis 2 spindle, older type
1½" Landis Stay Bolt Threading Machine, Double Head, m.d.
No. 326 Ostar Bolt & Pipe Threading Machine, m.d.

HORIZONTAL BORING MILLS

#7 Barrett Horizontal Boring Machine
3" Universal Horizontal Boring Mill, m.d.
No. 25T Giddings & Lewis, m.d., late
No. 32 Lucas, m.d.
Barrett Double End, 7" and 5" spindles, m.d.
5" bar Ohio Table Type, m.d.
5½" bar Betts Floor Type, m.d.
5½" bar Niles-Bement-Pond, m.d.
6" bar Newton No. 2 Cylinder Borer, m.d.
10" bar Sellers Floor Type, m.d.
Natco Horiz. Drill, with 2 spindles on one end, m.d., late
Floor Plates—all sizes

VERTICAL BORING MILLS

24" Bullard Spiral Drive, 1943
42" Bullard Spiral Drive, m.d., 1942
42" Bullard New Era, m.d.
42" King with side head and plain swivel head on rail, 1940
44" Putnam, m.d., p.r.t.
44" Niles, m.d., p.r.t.
48" Niles-Bement-Pond Car Wheel Borer, m.d.
53" Niles Heavy Pattern, m.d., p.r.t.
73" Niles, m.d.
100" Niles Heavy, m.d., p.r.t
102" Niles Wheel Turning Boring Mill
12' Niles, m.d., p.r.t.

BROACHING MACHINES

75 H.P. LaPointe Hydraulic Broach, m.d.
12x72" Thompson Automatic Flat Broach, m.d.
10 ton, 84" stroke Single Ram Vertical Surface Broach, LaPointe, m.d., late
Type SBD-42-6 American Vertical Hy. Dup. Broach
Type SBD-48-15 American Vertical Dual Ram Surface Hydr. Broach
Oilgear Hydraulic Broach, type XA, 54" stroke, m.d.
Type 3L8 LaPointe Horiz. Hydraulic, m.d.

RADIAL DRILLS

2'9" col. Fosdick, m.d.
2½'-10" col. American Triple Purpose, m.d.
3'-9" col. Cincinnati Bickford, m.d.
4'-13" col. Fosdick, Economax Plain, m.d.
5'-14" col. Carlton, m.d.
7'-16" col. American Triple Purpose, m.d.
7'-17" col. American, Universal Table
8'-17" col. American, Triple Purpose
8'-17" col. Dreses, gear box m.d.
Zeus Precision Universal Bench Type Radials, m.d., new
Baush Radial Drilling & Tapping Machine, m.d.

BALL BEARING DRILLS

No. 2 Avey Single Spindle, m.d.
No. 4 Fosdick, 8" overhang, High Speed, m.d.
No. 15 Buffalo Floor Model, m.d.
No. 18 Canedy Otto Bench Model, m.d.
No. ½, 1, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 2 Avey Single Spindle, m.d.
2 spindle Allen, belted m.d., 8" overhang
No. 2LMS Leland-Gifford, single spindle, High speed, m.d.
2 spindle Avey, size No. 1, type B, style VHP, m.d., 8" overhang
2 spindle No. 3MA6 Avey High Speed, m.d.
3 spindle No. 2MA6 Avey High Speed, m.d.
2 spindle No. 2 Leland & Gifford High Speed, 8" overhang, m.d.
3 spindle Leland & Gifford #1LMS—High Speed, late, m.d.
3 spindle Leland & Gifford High Speed, Model 3MS, m.d.
4 spindle Leland & Gifford, m.d. on each spindle
6 spindle Leland & Gifford, m.d. on each spindle, No. 2 Taper

HORIZONTAL DRILLS

3 way Natco Horizontal Drill, consisting of 3 E13 Heliounits
No. ½Bx36" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. ½Bx50" Pratt & Whitney Gun Barrel Rifling Machine, m.d., latest
No. 1Bx74" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. 1½x105" Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, m.d.
No. 1 Pratt & Whitney 2 spindle Deep Hole Drill, belted m.d.
Model 410 W.F. & John Barnes 2 spindle Hydraulic Deep Hole Drill, m.d.
Pratt & Whitney Deep Hole Drill Sharpener, m.d.

SEND FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio — MElrose 1241 — CABLE ADDRESS **EMCO**

WANTED

GLEASON #27 HYPOID TESTER

With Standard Equipment

LeTOURNEAU-WESTINGHOUSE CO.

Purchasing Dept.

Box 240, Peoria, Illinois — **Phone 3-4521**

ELECTRIC FURNFACES TO 1850F

with Auto Temp Control. Sliding door, heavily insulated, substantial, accurate, dependable for machine shop, tool room, laboratory New
8"x12"x15" Inside 4.5 K.W. $300.00
12"x16"x20" Inside 9.0 K.W. $500.00

ELECTRIC TEMPERING POT 350-1000F

with Auto Temp Control: 3 gal. cap. uses No. 1 salts permits such tempering after quenching. Complete with Basket and 40 lbs. No. 1 salts $100.00

E. H. WILLIAMS
BOX 9042A, HUNTINGTON, W. VA.

PEACOCK CORPORATION
Propane Gas Installations
and
Anhydrous Ammonia Plants
Paul E. Peacock, Jr., Pres.
Box 268 Westfield, N. J. Westfield 2-6258

Useful for Design, Shop & Inspection Work
MACHINE TOOL RECONDITIONING & the Art of Hand Scraping
Write for folder describing illustrated book
MACHINE TOOL PUBLICATIONS
215 Commerce Bldg., Fourth & Wabash Sts.
St. Paul 1, Minn.

PATENT

For Sale on a continuous operation stranding machine, granting 24 claims of originality, patented in Great Britain, U. S. & Canada in 1951. Write

D. YAKE
515 SUTHERLAND RD., TRENTON, N. J.

BLIND MANUFACTURING CO., Nev. Mfgrs. venetian blinds, draperies, awnings, shades, vert. blinds, etc. Xclsve franchise. Grosses $60,000 yr. with $21,000 net. R.E. incl. Priced to sell. **Dept. #22127-A**

BOWLING EQUIPMENT REPAIR, Los Angeles, Calif. Netted $8,280 in 6 mo., 1955. Handles refinishing of bowling pins. Priced at only $12,750. **Dept. #22303**

CHAIR MANUFACTURING CO., So. Cen. Alabama. Choice site. Employes 10. No union! Xlnt. profits. Priced at only $15,500. **Dept. #6543-A**

HEATING & SHEET METAL WORKS, So. Calif. Netted $1,600 in 3 mo., 1955. 50 x 100 land on mn. thoroughfare w/bldg. opt. Priced at only: $7,000 plus opt. R.E. **Dept. #22252-A**

MACHINE SHOP, Los Angeles, Calif. Handles precision machine shop work for aircraft & allied industries. Compl. new equipment. 4500 sq. ft. of space in new bldg. POTENTIALITIES UNLIMITED! Other interests force sale at only $53,000. Principals only. **Dept. #22291**

METAL WORKS, N. E. Georgia. Good indust. city. Nets $2,820. Booming bus., growing wkly. Owner equipt. **Dept. #6584-A**

MILL & CABINET WORKS, N. E. Texas. Gross sles. $209,864.96. New business spot in nation. Excellent buy, good opportunity. **Dept. #6559-A**

PATIO FURNITURE, Mfgr. & Sales. Top So. Calif. city. Nets $10,000 per yr. Mn. hiway land w/all bldgs. & home incl. Priced low for quick sale. Terms. **Dept. #22270-A**

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SCREW MCHS: (2)—BROWN & SHARPE # 2 G Auto. 1" cap., new in 1952, auto. feeds, 12' cap. mags. with extra equipt.
AUTO CHUCKERS: (2)—WARNER & SWASEY #1AC, 6", new in 1954, completely equipped.
VERT. LATHES: BULLARD 30"-36" "Cutmaster" vert; mfd. in 1952, Bullard "New Era" 36" vert. (1943).
BORING BARS: UNIVERSAL „Triway" 3" 1942, Giddings & Lewis #32-3".
LATHES: (14)—MONARCH, AMERICAN "PACEMAKER", AXELSON, HENDEY AND BRADFORD TOOL ROOM LATHES, 38½x84, 25x72, 20x67, 20x43, 16x54 and 14x30—late type, 1941 to 1947.
TURRET LATHES: (40)—WARNER-SWASEY 3A, 1A, #5, #4, #3, #2, bar feed, preselector and plain.
(2)—GISHOLT #5-#3, (2) JONES & LAMSON #3, (1) MONARCH 16" turret, all 1941 to 1947 mchs.
PRE. BORERS: (21)—EX-CELL-O 1 and 2 Spdl. Hyd. models DB112C, DB2112A, DB2112C, mfd from 1941 to 1952. KRUEGER 2 Spdl. vert. hyd. Borer & Reamer.
MILLERS: (10)—KEARNEY & TRECKER 2H, 3H, 1B univ. and plain
(2)—CINN. 2 MH plain.
RADIAL DRILLS: FOSDICK "Economax" and CINN. GILBERT, late type, 4'-11", mfd 1943.
BROACHES: (12)—OILGEAR & PORTER horiz. mod. XL 20, 6M20, 5M16, mfd. 1945-1947.
DRILL PRESSES: (8) LELAND-GIFFORD, 4 spdl. 1943-1944, #2 lms., (2)—FOOTE-BURT 3 spdl., (3) GOVRO NELSON multiple, (3) BARNES camelback mult., (1) P&W #1B deep hold hor. 2 spdl., mfd in 1948.
LAPPERS: NORTON #26 hydrolap 1943, Excello center lapper.
PROD. LATHES: (35) LEBLOND rapid prod. and "multi-cut" 13" to 20", (8) SUNDSTRAND mod. 8 auto. (8) LO-SWING & FEDERAL, (4) FAY auto. 8", 12".
COINING PRESSES: MINSTER #90—800 ton, 1945, TOLEDO #664—600 ton.
S.S. & HYD. PRESSES: NIAGARA #510—7 w. cushion (1951) (4) MINSTER #40-5w. cushions (1943). (3) TOLEDO #54, #55, and #50½, Dennison 5 ton hyd. (1944) Logan hyd.
O.B.I. PRESSES: (18 MINSTER #7-#5-#4-#3 all late 1941 to 1945, V. and O #50.
PROD. MILLS: (25)—KENT-OWENS & NICHOLS models 2-20, 1-14, 1M, 2RV and #2, 1941 to 1952.
GRINDERS CENTERLESS: (2) CINN. #3M and 2M filmatic, (2)—CINN. plain centerless.
GRINDERS CYL and INT: (17) LANDIS, BROWN & SHARPE and CINN. #2 and 3 univ. filmatic 10x24, 12x30, 10x18, 14x36, plain and univ. HEALD 72A—int. late type.
GRINDERS SURFACE: THOMPSON 14"x40" type C twin wheel, magnetic, new 1952. (6) REID, B&S Abrasive and Wilmarth and MARMAN magnetic.
TESTING LAB: TINIUS-OLESON 120,000 lb. tensile, BAUSCH & LOMB spectograph, spectograph aux, equipt., Hoskins furnace, centrifuge, etc.
PLATING DEPT.: UDYLITE cont. auto unit 6-rectifiers, 1952 installation. Wagner & Udylite rectifiers, (20) KOROSEAL, stainless and steel tanks, buss bar, tumblers, etc.
MISC. MCH. TOOLS: WOHLFAHRT D.E. borer and reamer (1947), PORTER D.E. bearing finisher (1947), LEES-BRADNER 40A tapper, GROVO NELSON multiple drills, FISHER #1 oil groovers (1943) American Shapers, chamfering mchs., 2 and 4 spd. (2) GROB metal saws (1952) (3) 6-spdl BABBITT spinner, pattern shop, and many other items.
FOUNDRY: Brass, babbitt and iron foundry equipt., U. S. and Hausfeld furnaces, spinners, Blystone mixer, (9) Industrial furnaces, 4500-6000 lbs., (3) Pangborn rotoblasts, 6 spdl Babbitt mchs., Osborn moulders, Tabor wheel saws, etc.

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BORING MILLS—Horizontal

JIG BORERS
DEFIANCE Boring Mill 3¾" bar; late type
DIXI type 60 Swiss Jig Borer; 2.362" bar; late type
FOSDICK #30A Jig Borer; late type
GIDDINGS & LEWIS 340-T; 4" bar; late type
HEALD #49, double end Borematic; M.D.
HY-OP #51 Jig Borer; late type
LUCAS #21 2½" bar; table type
NILES 8" bar; floor type; motor drive
SELLERS 5" Boring Mill; motor drive; late type

BORING MILLS—Vertical
BULLARD 8", 6-spindle & 16" 6-spindle Type "D" Mult-au-matic; late type
BULLARD 24" spiral drive; PRT; late type
CINCINNATI 54" Hypro, motor drive; late type
NILES 53", 2 swivel heads, PRT; M.D.
SELLERS 144", 2 swivel heads on cross rail; PRT

BROACHES
CINCINNATI I-30 Duplex Vertical cap. 1 top 30" stroke; Hydraulic; late
COLONIAL VGI-10-48 Vertical; Hydraulic; late type
LAPOINTE 10-54" Vertical, Model SRV; new 1947
OILGEAR 3XA horizontal; cap. 20,000 lb; 56" stroke; hydraulic; late type
OILGEAR type XL-6 single ram; late type

DRILLS—Manufacturing
AVEY #2—2 spindle high speed, motor drive, late
BARNES #262 Heavy Duty Camel Back; late type
BARNES H-2 Hydram; 2" cap.; 22" swing; hydraulic
LELAND-GIFFORD 1LMS, 4-spindle, M.D.; late
LELAND-GIFFORD 2LMS, 2-spindle, M.D.; late
NATCO B-4-B "Hole Steel" 60 adj. spindles; late
NATCO B-3-B "Hole Steel" 12 adj. spindles; late
NATCO E-5 high speed, 10 adj. spindles; late

FELLOWS GEAR EQUIPMENT
FELLOWS No. 6 High Speed Gear Shaper; late
FELLOWS No. 48 High Speed Gear Shaper; internal cap. 72" diameter; late type
FELLOWS No. 61 and 61A High Speed Gear Shaper
FELLOWS No. 672 High Speed Gear Shaper; late
FELLOWS No. 7, 7A, No. 72 and No. 75 High Speed Gear Shaper; late type
FELLOWS No. 13 LS Lapper; motor drive, late
FELLOWS 20-M Red Liner; New 1954

GLEASON GEAR EQUIPMENT
GLEASON 3" Spiral Gear Generator; late type
GLEASON No. 7 Hyp. Cutter Sharp; latest type
GLEASON 12" Spiral Bev. Cutter Sharpener; M.D.
GLEASON 12" Straight Bevel Generator; late type
GLEASON No. 17 Hypoid Tester & Lapper; late
GLEASON No. 18 Gear Tester and Lapper; M.D.
GLEASON No. 20 Spur Gear Tester; latest type
GLEASON 22" Straight Bevel Gear Gen.; M.D.
GLEASON 24" and 32" Bevel Gear Planer; M.D.
GLEASON 25" Spiral Bevel Gear Gen.; M.D.
GLEASON No. 6 Revacycle 5" cone distance; late

GRINDERS, Cyl. Plain & Univ.
CINCINNATI 14"x72" Universal; M.D., late type
CINCINNATI 6"x18" Med ER Plain, "Filmatic"; late
LANDIS 20"x144" Plain Cyl. gap type, M.D., late
LANDIS 4"x12" Type H Hydraulic; late type
LANDIS 10"x18" type C Plain, Hydraulic, late
LANDIS 10"x36" type DC plain hydr. with infeed; late
LANDIS 10"x36" type "C" Universal, M.D. late
LANDIS 20"x144" Plain Gap Grinder; late type
NORTON 4"x12" Model CTU Plain, year 1953
NORTON 6"x18" Type "C" Plain; late type
NORTON 10"x48" Type C Hydr. Plain Cyl; late type

GRINDERS—Internal
BRYANT #5 Internal, hydraulic, late type
BRYANT #16-C-16 Internal, Hydraulic, late
BRYANT #34—36" Internal, hydraulic
HEALD #70A Internal, motor drive, late type
HEALD #78 Centerless; motor drive; late
HEALD #81 pl. chuck type, hydraulic; New 1947
BLANCHARD #18, motor drive; late type
BROWN & SHARPE #2, motor drive; late type

LATHES, Turret
GISHOLT #1L and #2L Saddle type; Timken; late
GISHOLT #3L Universal ram type; M.D., late type
LIBBY #4H, 12" hole, motor drive, late type
MOREY #2, #3, #4, #5, ram type; Timken; latest
WARNER & SWASEY #1-A Universal; Hex., late

LATHES, Engine & Mfg.
AMERICAN 36"x25' o.c., PRT; 2 cross slides; late
GISHOLT #12 Hydraulic Automatic; motor drive; late
HENDEY 24"x36" centers; motor drive; late type
HENDEY 16"x72" centers; M.D., late type
LeBLOND 20"x48" centers, Timken; M.D., late type
LODGE & SHIPLEY 12"x30" centers, Toolroom
LODGE & SHIPLEY 14"x30" centers; late type
MONARCH 20" (raise to 30½") x 144" c.c., late type
MONARCH 22M, 22"x264" c.c. and 22"x336" c.c., late
MONARCH 24"x96" centers; motor drive; late type
NILES 30"x100" c.c. Geared Head; Timken; late
NILES 36"x100" centers "Time Saver"; motor drive
PRATT & WHITNEY 16"x30" centers; Timken, late
SPRINGFIELD 20"x40" o.c., motor drive; late type
SUNDSTRAND 10"x60" centers; auto Type B; late

MILLING MACHINES, Plain
BROWN & SHARPE #2B, motor drive, late type
BROWN & SHARPE #10, motor drive; late type

MILLING MACHINES, Thread
HALL Style "D" Planetary; late type
LEES BRADNER Model #LT 6"x30" and 6"x72"; #HT 12"x24" and #HT 12"x36" centers; late type
MOREY 12"x30" and 12"x160" centers; late type
CINCINNATI 2MH horizontal univ., motor drive, late
BROWN & SHARPE #2 Light Type, motor drive

MILLING MACHINES, Vertical
CINCINNATI #4 High Speed Dial type; late
CINCINNATI 8-B Vertical; Timken; late type
STEINEL SV44, #30 taper, 6 spindle speeds; latest

PLANERS
GRAY 48"x48"x10' "Maximum Service" 4 hds; PRT; DC; Reversing, Late type
LIBERTY 144"x76"x48" adj. openside; box table; 4 hds; vari-voltage; PRT; New 1940
NILES-BEMENT-POND 72"x72"x30"; 4 hds; PRT
POND 60"x60"x14', 4 heads, motor drive, late type
SOUTHWARK plate-edge Planer; 16 ft; late type

PRESSES
BLISS #410A, 525-ton double action toggle drawing
NATIONAL #5 "Maxi-Press", 1000-ton cap. H.S. Forging Machine; M.D.
WATERBURY FARREL #9, 125-ton cap., M.D.

SHAPERS
GOULD & EBERHARDT 32"; High Speed; M.D.
HENDEY 12" High Speed Univ. Crank Shaper; late
MOREY 8" Vertical; Motor drive; late type
ROCKFORD 16" Shaper, motor drive; late type

MISCELLANEOUS
ALEXANDER #2, 3-dim. Engraving NEW 1952
AVEY No. 2, 2-spindle Drill Press; late type
BARNES No. 172 Honing; M.D., hydr.; late type
HILLES & JONES #7 Plate Bending Roll; capacity 7/8" x 16'; motor drive
LeBLOND No. 2 Deep Hole Reaming, late type
LeBLOND No. 2 Deep Hole Rifling, late type

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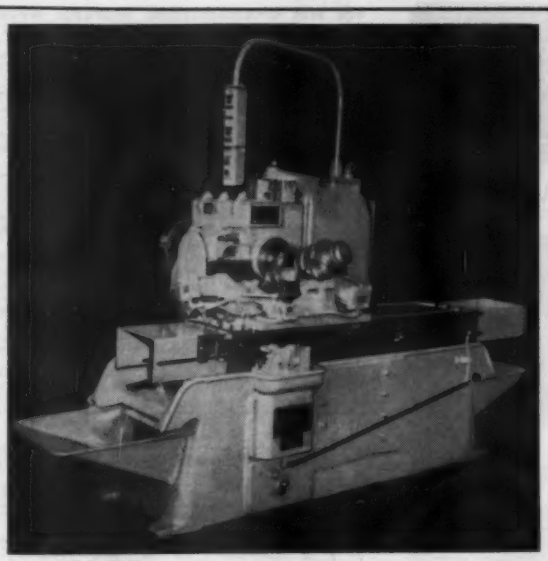

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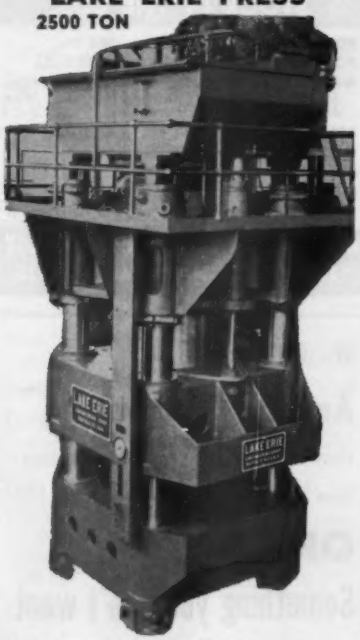

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No. 81 Heald Int. Centerless
No. 74 Heald Int. Centerless
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No. 72A5 Heald Int. (1943)
No. 72A5 Heald Bridge Int.
No. 74 Heald Ext. Bridge
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No. 3AL Gisholt Cross Slide
No. 3H-10 Libby International
No. 3A Warner & Swasey Turret Lathe
No. 4A Warner & Swasey M.D.
No. 4A Warner & Swasey (1944)
No. 7 Bardons & Oliver V.T.L.

MILLING MACHINES
No. 2HL K. & T. Milwaukee Plain
No. 4 Cincinnati Dial Type Plain
No. 98 Cincinnati Vertical
118 Van Norman Hyd. Mfg. (1942)
Model A Briggs Mfg.
54"x20"x16' Ingersoll Slab
10"x60" Pratt & Whitney Thread
12"x102" HT Loss-Bradner Thread
Model CT Loss Bradner Thread Mill (1942)
No. 36 Van Norman Pl.

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60"x48"x27' American, 4 heads

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No. 5A Kaufman Pneu. Tapper
8 Spdl.—6" Goss & DeLeeuw Chucker
No. 56 Sundstrand Double End Cent. Mach.
Foote-Burt 1 Spdl. Boring Mach. (1941)
15" Dill Slotter
18" Dill Slotter
Model 200 Micromatic Hor. Hone
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No. 2, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

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No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D., Late.

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4'x15" CARLTON Radial Drill. Motor on arm.

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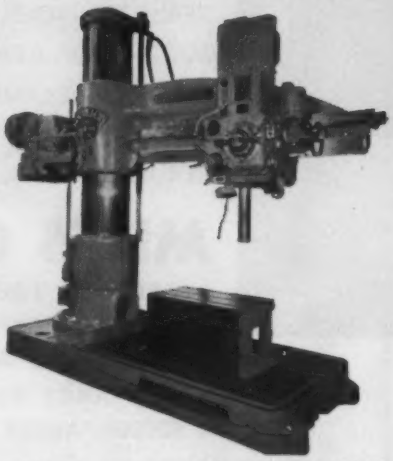

6' ARM x 19" COL. CARLTON RADIAL DRILL, 20 HP., LATE TYPE, 1943

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No. 2 M. T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive, Late Type.

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⅓, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

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No. 8LS FELLOWS M.D. Gear Lapping Machine. Detachable Head, Univ. Work Support.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine. M.D. Late type.

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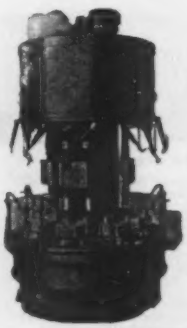

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Index of PRODUCTS ADVERTISED

In This Issue

Abrasives, Coated 199

Accessories & Attachments (Machine Tool) 64, 97, 104, 168, 258, 296, 297

Arbors & Mandrels 280

Balancing Machines 70-71

Bearings 49, 76, 280, 300

Bending Machines 243

Books, Technical 266

Boring, Drilling & Milling Machines (Horizontal) 14-15, 252-253 270, 294

Boring Machines Internal ..... Second Cover, 106

Boring & Turning Machines (Vertical) ..... 57, Insert Bet. 64A-64D, 66-67, 252-253, 294, 299

Broaching Machines 4-5, 64D, 164

Cams 260

Castings 226, 240-241, 264

Centers, Live 268

Centrifugal Machines 284

Chucks 216, 232, 282, 284, 297

Cleaning & Drying Machines & Supplies 222

Collets 258, 284

Controls, Electrical ..... 40-41, 86-87, 88-89, Insert Bet. 216-217, 255

Die Sets 104

Drafting Room Equipment & Supplies 102-103

Dressers 284, 298

Drilling Machines ..... 3rd Cover, 30-31, 36-37, 42, 70-71, 90-91, 206-207, 234, 264, 274

Drill Jig Bushings 106, 200, 266

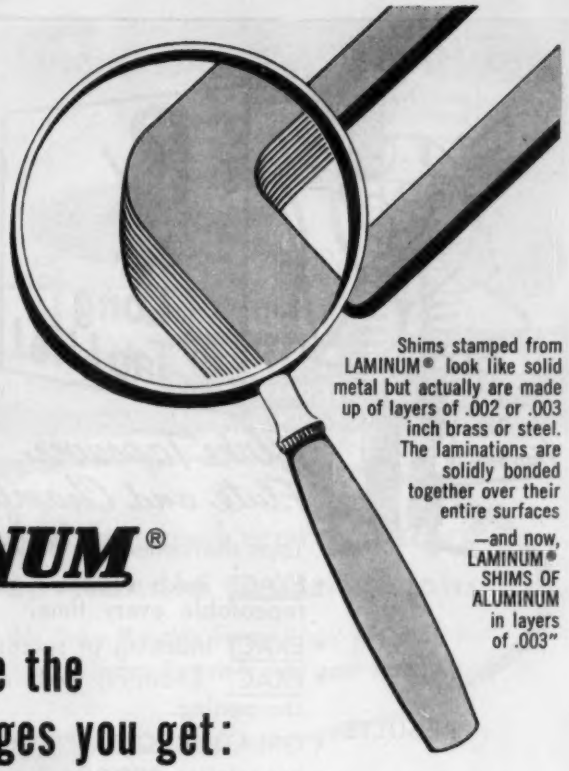
Electrical Parts & Equipment 86-87, 88-89

Eyeletting Machines 268

Fabricating Methods & Services 79, 80-81, 201, 260, 273

Fasteners 43, 259, 275

(Continued on page 292)



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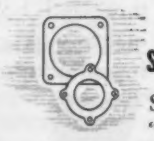

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Index of PRODUCTS ADVERTISED

In This Issue

•

(Continued from page 291)

Files, Hand.....Insert Bet. 248-249

Floor Drying Compounds..... 212

Gages & Instruments 16, 44, 78, 92, 102-103, 202-203, 215, 244, 248, 260, 282, 292, 294, 295, 297

Gear Cutting Machines....3, 6-7, 48, 62-63, 221

Gears, Speed Reducer, Motor Reducers.....189, 221, 227, 238, 242

Gear Testers.....3, 6-7

Grinders—Cutter & Tool....99, 101, 187, 262, 292

Grinding Machines—Production.....8-9, 12-13, 18-19, 52-53, 64A, 93, 99, 203, 249, 269

Grinding Wheels....17, 26-27, 45, Insert Bet. 72-73, 203

Heads: Drilling, Grinding & Tapping.....10-11, 234, 238, 284, 299

Heat Treating Equipment & Supplies..... 22-23, 65, 235, 293

Honing Machines..... 94

Hydraulic & Pneumatic Parts & Equipment.....34, 117

Jig Borers..... 280

Jigs & Fixtures..... 260

Lathes, Automatic.....Insert Bet. 32-33, 46, 52-53

Lathes, Engine.....59, 73, 84-85, 96, 187, 225, 276

Lathes, Turret.....46, 52-53, 187

Lubricants, Cutting Fluids, Quenching Oils & Solvents....56, 60-61, 68-69, 95, 114, 195, 237, 246, 264, 278, 285, 296

Lubricating Systems & Equipment.... 191

Marking Machines, Tools, & Supplies.....100, 224, 264

Materials, Cutting & Forming....4th Cover, 102-103, 108, 228, 254

Materials of Manufacture....35, 51, 82-83, 108, 118, 166, 184B, 204, 211, 254, 263, 267, 271, 276, 281

Materials Handling Equipment....58, 110

Index of PRODUCTS ADVERTISED

In This Issue

Millers, Die Sinkers, Profilers....20-21, 50, 229, 283

Motors, Electrical.....32, 40-41, 218, 265

Oil Purifiers..... 284

Planers 28-29

Power Transmission.....38, 247

Presses, Forging & Forming Equipment & Supplies.....77, 97, 162, 193, 201, 205, 209, 223, 239, 250, 262, 266, 276, 280, 293, 296

Production, Inventory & Tool Control 210

Pumps, Circulating.....34, 228, 272

Riveting Machines.....117, 284, 298

Saw Blades.....102-103, 256-257, 274

Sawing Machines.....33, 102-103

Screwdriving Machines 219

Screw Machines; Chucking Machines.....39, 55, 193, 220

Shapers, Slotters, Keyseaters....120, 187, 282, 285

Shop Furniture..... 214

Special Machine Tools.....50, 112-113, 161, 217, 245, 260

Spindles, Machine 264

Springs 24-25

Stampings 291

Steel Bloe..... 260

Tapping Machines.....90-91, 276

Thread Cutting Machines.....10-11

Thread Rolling Machines & Tools 10-11

Tools, Cutting....47, 64D, 72, 98, 168, Insert Facing 184, 197, 202-203, 208, 214, 233, 236, 242, 251, 258, 264, 268

Tools, Measuring 102-103

Transportation 54

Used & Surplus Equipment.....286-290

Vises 258

Welding & Cutting, Brazing & Soldering Equipment & Supplies 74-75, 185, 213, 235, 273, 279, 295

Wiping Material.....230-231

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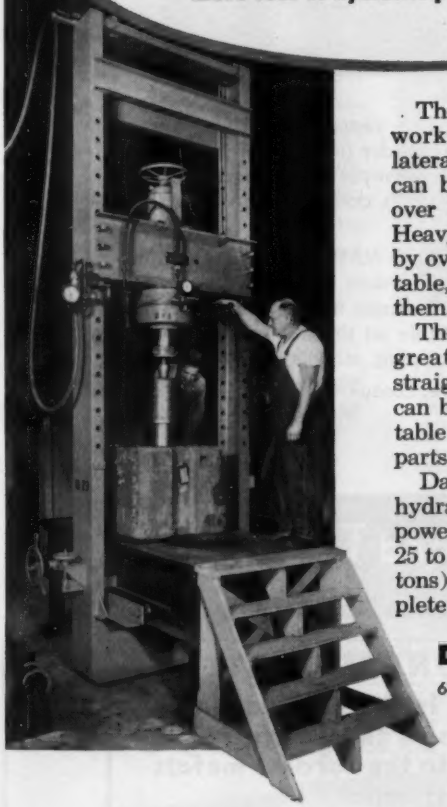

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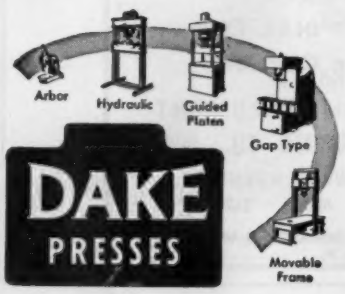

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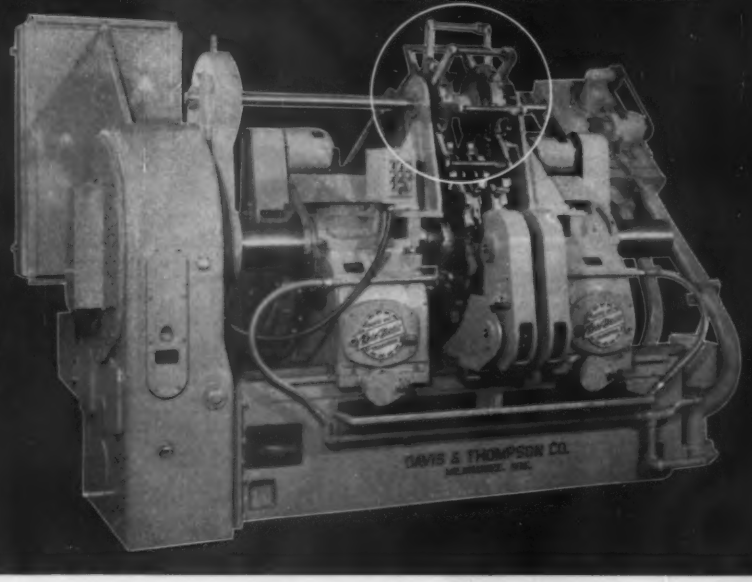

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INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions

	Page
Abrasive Machine Tool Company	249
Ace Drill Corporation	214
Acromark Company	264
Alemite	191
Allen-Bradley Company	Insert Bet. 216-217
Allis-Chalmers Manufacturing Co.	32, 38
Allmetal Screw Products Co. Inc.	259
Alpha Molykote Corp.	264
Alvord-Polk Tool Company	264
American Brass Company	271
American Broach & Machine Co.	64D
American Chain & Cable Co., Inc.	58, 244
American Ligurian Co., Inc.	299
American Machinist	261
American Screw Company	259
American Steel Foundries King Machine Tool Division	57
American Steel & Wire Division	24-25
American Tool Works	59
American Welding & Manufacturing Company	185
Ames Company, B. C.	248
Armco Steel Corporation	118
Armstrong-Blum Mfg. Co.	33
Armstrong Bros. Tool Co.	64
Arter Grinding Machine Co.	269
Atlantic Refining Company	237
Atlantic Screw Works, Inc.	259
Attapulgus Minerals & Chemicals Corporation	212
Automotive Gear Works Inc.	189
Avey Drilling Machine Company	36-37
Baird Machine Company	193
Barber-Colman Company	62-63
Barrett Company, Leon J.	284
Bath Co., Inc., John	72
Besly-Welles Corporation	202-203
Blake Co., Edward	292
Blake & Johnson Co.	259
Blanchard Machine Co.	64A
Blount Co., J. G.	262
Buffalo Forge Co.	206-207
Buhr Machine Tool Co.	245
Bullard Co.	Insert Bet. 64A-64D
Carborundum Company	Insert Bet. 72-73
Carpenter Steel Company	281
Central Screw Company	259
Century Electric Company	265
Challenge Machinery Co.	214
Chandler Tool Company	299
Chase Brass & Copper Co., Inc.	277

INDEX TO ADVERTISERS

	Page
Cincinnati-Bickford Tool Co.	42
Cincinnati Gear Co.	242
Cincinnati Gilbert Machine Tool Co.	3rd Cover
Cincinnati Milling Machine Co.	4-5
Cincinnati Milling Machine Co. Grinding Wheels Division	45
Cincinnati Milling Machine Co. Hydroform Division	77
Cincinnati Shaper Company	120
Circular Tool Company	258
Cleveland Punch & Shear Works Company	250
Climax Molybdenum Co. of New York	204
Columbia-Geneva Steel Div.	24-25, 82-83
Columbia Tool Steel Company	228
Columbus Die-Tool & Machine Co.	260
Comtor Co.	282
Cone Automatic Machine Co.	55
Consolidated Machine Tool Corp.	66-67
Continental Screw Company	259
Copperweld Steel Company	166
Coulter Machine Co., James	276
Cross Company	161
Crucible Steel Co. of America	35
Dake Corporation	293
Danly Machine Specialties Inc.	104
Davis Keyseater Company	282
Davis & Thompson Co.	294
De Laval Steam Turbine Co.	272
Desmond-Stephan Mfg. Co.	298
Detroit Power Screwdriver Co.	219
Detroit Reamer & Tool Company	233
Di Machine Corporation	223
Disston & Sons, Inc., Henry	256-257
Dykem Company	260
The Eagle Lock Company	259
Eastern Machine Screw Corporation	284
Eastman Kodak Co., Special Products Division	215
Edlund Machinery Company	264
Eisler Engineering Co., Inc.	260
Elco Tool & Screw Corporation	259
Ex-Cell-O Corp.	106
Fairbanks, Morse & Company	218
Fellows Gear Shaper Company	6-7
Forkardt K. G., Paul	282
Fosdick Machine Tool Company	30-31
Gardner Machine Company	17
General Electric Co., Apparatus Dept.	22-23, 40-41, 74-75, 79, 80-81, 86-87, 88-89
General Pacific Corp.	296
Giddings & Lewis Machine Tool Company	14-15

(Continued on page 296)

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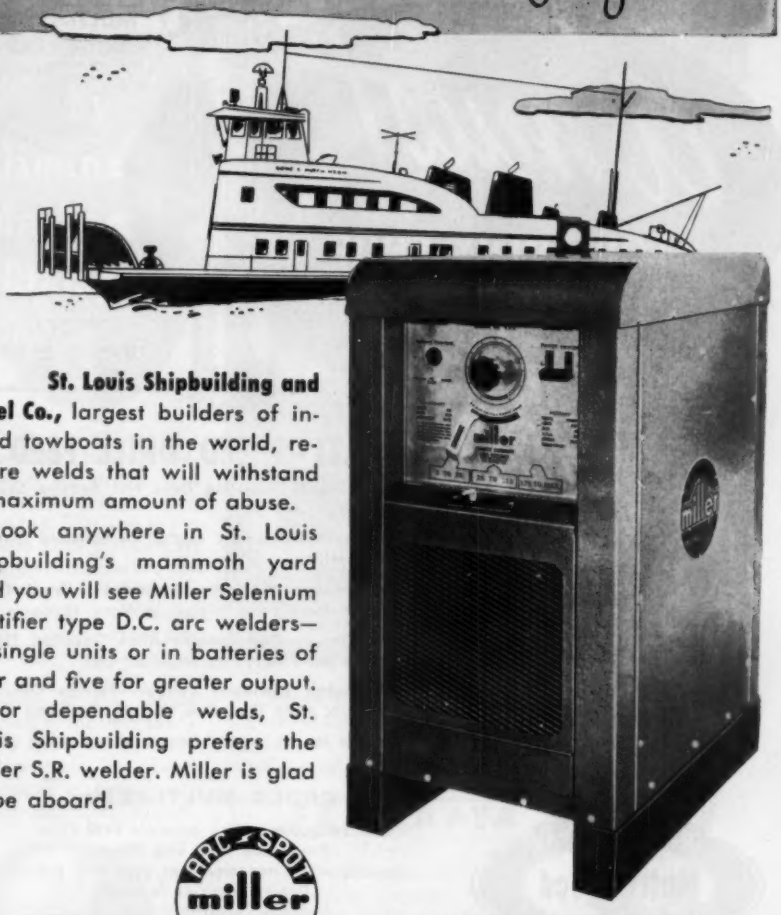

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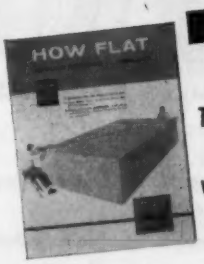

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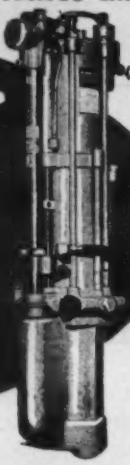

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INDEX TO ADVERTISERS

(Continued from page 295)

	Page
Gisholt Machine Company	46
Gleason Works	3
Goss & DeLeeuw Machine Company	220
Grant Mfg. & Machine Company	284
Gray Co., G. A.	28-29
Great Lakes Screw Corporation	259
Greenfield Tap & Die Corp.	Insert Facing 184
Hamilton Tool Company	110
Hancock Manufacturing Co.	284
Hannifin Corp.	262
Hardinge Brothers, Inc.	96
Harnischfeger Corp.	279
The Harper Company, H. M.	259
Hartford Special Machinery Co.	217
Haynes Stellite Co. Div. Union Carbide & Carbon Co.	254
Heald Machine Company	2nd Cover
High Speed Hammer Co., Inc.	298
Hones, Inc., Charles A.	293
Houghton & Co., E. F.	278
Houghton Laboratories Inc.	211
Hy-Pro Tool Co.	197
Illinois Gear & Machine Company	221
nnocenti	252-253
I-T-E Circuit Breaker Co. Transformer & Rectifier Div.	247
Jacobs Mfg. Company	216
Johnson & Son, Inc., S. C.	60-61
Jones & Lamson Machine Co.	52-53
Kano Laboratories	285
Kaufman Mfg. Co.	276
Kaukauna Machine Corp.	274
Kearney & Trecker Corp.	20-21, 50
Kenco Mfg. Co.	276
Kennametal Inc.	263
King, Andrew	292
King Machine Tool Div. American Steel Foundries	57
Lamina Dies & Tools Inc.	266
Laminated Shim Co., Inc. (Shim Div.)	291
Lamson & Sessions Company	259
Landis Machine Company	10-11
Landis Tool Company	12-13
LaPointe Machine Tool Company	164
LaSalle Steel Company	267
Lavallee & Ide Inc.	98
LeBlond Machine Tool Co., R. K.	84-85
Lees-Bradner Company	48
Linde Air Products Div. Union Carbide Corp.	235

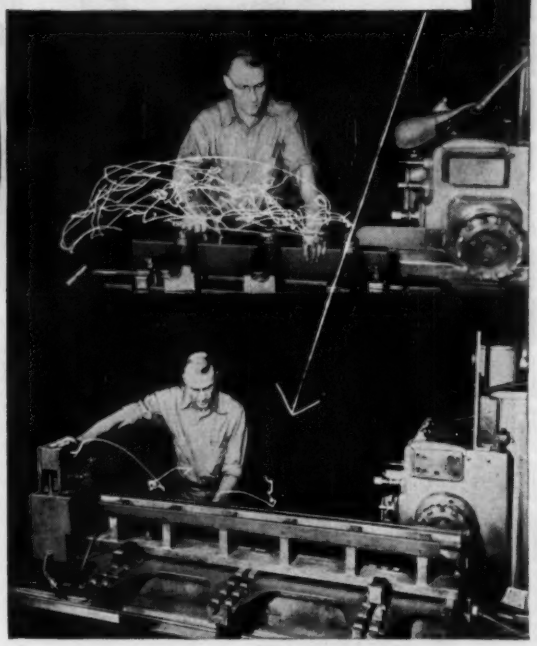
INDEX TO ADVERTISERS

	Page
Link-Belt Co.	49
Linley Brothers Co.	280
Lodge & Shipley Company	73, 97
Mahon Company, R. C.	273
Mallory & Company, Inc., P. R.	213
Marvel Tool & Machine Co.	268
Massachusetts Gear & Tool Co.	238
Mattison Machine Works	93
M.B.I. Export & Import, Ltd.	280
McCaskey Industrial Div. Victor Adding Machine Company	210
McGill Mfg. Co.	76
McGraw-Hill Book Co., Inc.	266
Meehanite Metal Corp.	240-241
Metal Carbides Corp.	251
Michigan Drill Head Co.	234
Micromatic Hone Corp.	94
Miller Electric Mfg. Co.	295
Minganti & C., G.	299
Minnesota Mining & Mfg. Co.	199
Mitts & Merrill	285
Morris Machine Tool Co.	70-71
National Acme Company	39
National Automatic Tool Co.	90-91
National Lock Company	259
National Malleable & Steel Castings Company	226
National Screw & Manufacturing Company	259
National Tool Company	47
New Departure Div. General Motors Corporation	300
Nichols-Morris Corporation	229
Nicholson File Company	Insert Bet. 248-249
Nilson Machine Co., A. H.	239
Noble & Westbrook Mfg. Co.	100
North Brothers Mfg. Company	258
Norton Company	18-19, 26-27
Oakite Products Inc.	222
Ohio Crankshaft Company	65
Oliver Instrument Company	101
O'Neil-Irwin Mfg. Co.	205
Parker-Kalon Division, General American Transportation Corp.	259, 275
Parker Stamp Works Inc.	224
Pheoll Manufacturing Company	259
Philadelphia Gear Works	227
Pines Engineering Co. Inc.	243
Pope Machinery Corp.	264
Portage Machine Co.	270

(Continued on page 298)

HOW TO SAVE TIME...

by Eliminating Mechanical Clamping



Here's an interesting comparison between mechanical clamping and Sundstrand Magnetic clamping. The job is the same in both pictures. In the upper illustration the part is held on the table with mechanical clamps. In the lower picture the same part has been located and clamped in a magnetic fixture. Lights attached to the operator's wrists show how excessive motion has been eliminated with the Sundstrand magnetic fixture.

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INDEX TO ADVERTISERS

(Continued from page 297)

	Page
Precision Tool & Mfg. Company	238
Rahn Granite Surface Plate Co.	295
Railway Express, Air Express Div.	54
Randall Co., Inc., Frank E.	297
Reich, Mfg. Co., J. R.	284
Reid Brothers Co., Inc.	99
Rockford Screw Products Co.	259
Rodgers Hydraulic Inc.	209
Ruthman Machinery Company	228
Scherr Co., Inc., George	260
Scott Paper Company	230-231
Scovill Manufacturing Company	259
Screw Research Association	259
Segal, Edward	268
Shakeproof Division Illinois Tool Works	259
Sheffield Corp.	78
Sheldon Machine Company	225
Shore Instrument & Mfg. Co. Inc.	294
Sinclair Refining Co.	95
Skinner Chuck Company	232
Snyder Tool & Engineering Co.	112-113
South Bend Lathe Works	187
Southington Hdwe. Mfg. Company	259
Speedi-Dri Corp.	212
Spincraft Inc.	201
Square D Co.	255
Standard Oil Co. (Indiana)	68-69
Standard Tool Co.	92
Starrett Co., L. S. The	102-103
Sterling Bolt Company	259
Stewart-Warner Corp.	191
Stuart Oil Co. Ltd., D. A.	195
Sundstrand Magnetic Products Co.	297
Sun Oil Co.	56
Taft-Peirce Mfg. Co.	44
Tennessee Coal & Iron Div.	24-25, 82-83
Texas Co.	114
Timken Roller Bearing Company Steel & Tube Div.	4th Cover
Tomkins-Johnson Company	117
Union Carbide & Carbon Corp.	235, 254
U.S. Burke Machine Tool Company	283
United States Steel Corporation	24-25, 51, 82-83
U. S. Steel Export Co.	24-25, 82-83
United States Steel Supply Div. United States Steel Corp.	51, 82-83
Universal Engineering Corp.	200
Universal Screw Company	259
Vaill Engineering Company	296
Van Keuren Co.	16

INDEX TO ADVERTISERS

	Page
Van Norman Company	8-9
Vascoloy-Ramet Corp.	168
Verson Allsteel Press Co.	162
Vickers Inc.	34
Victor Saw Works Inc.	274
Virginia Gear & Machine Corp.	227
Vollrath Co. (Contract Div.)	264
Waldes Koh-I-Noor Inc.	43
Wales-Beech Corporation	259
Warner & Swasey Company	Insert Bet. 32-33
Weldon Tool Company	268
Wendt Sonis Co.	208
Wesson Co.	108
White & Bagley Company	246
Whitman & Barnes Inc.	236
Willey's Carbide Tool Co.	242
Wilson Air Collet Closer Inc.	258
Wilson Mechanical Instrument Div. American Chain & Cable Co.	244
Yoder Company	280
Youngstown Sheet & Tube Company	184B

CLASSIFIED ADVERTISING

F. J. Eberle, Ass't. Mgr.

EMPLOYMENT OPPORTUNITIES 285

SPECIAL SERVICES
- Contract Work 287
- Eastern Machine Screw Corp. 287
- General Pattern Works 287
- Transatlantic Engineering 287

EDUCATIONAL
- Books 286

BUSINESS OPPORTUNITIES 286, 287

EQUIPMENT
(Used or Surplus New)
For Sale 286-290

WANTED
- Equipment 286

ADVERTISERS INDEX

- Aaron Machinery Co., Inc. 289
- Acme School of Die Design Inc. 285
- Atlas Can Corp. 285
- Bennett Machinery Co. 288
- Brownell Machine Tool, Inc., Hazard 288
- Dony Machinery Co. 288
- Eastern Machinery Co., Inc. 286
- Edward & Associates, Ray 285
- Falk Mill Supply Co., Inc. 290
- Ford & Associates 287
- Herman Machy & Supply Co. 288
- Hill-Clarke Machinery Co. 289
- Hyman & Sons, Jos. 290
- Indianapolis Machinery & Supply Co. 288
- Letourneau-Westinghouse Co. 286
- Machine Tool Publications 286
- McDonald Machinery Co. 288
- Miles Machinery Co. 289
- Morey Machinery Co. 288
- National Machinery Exchange 290
- Peacock Corp. 286
- Smith Machinery Sales, Ed. 290
- Tool Design & Equip. Co. 288
- Williams, E. H. 286
- Winternitz & Co., Inc., A 287
- Yake, J. 286

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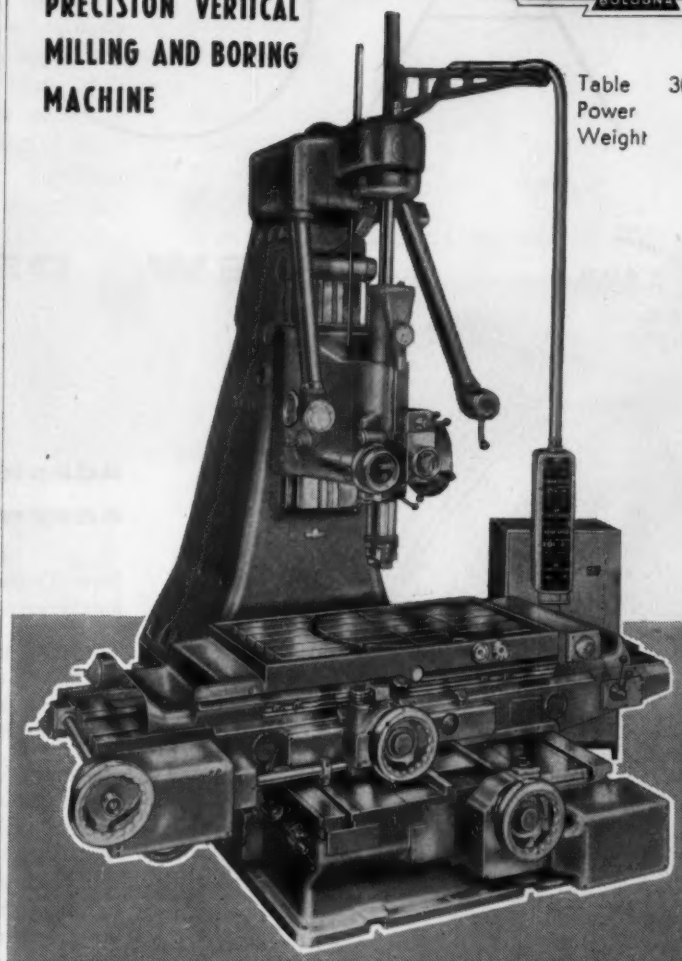

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about

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They are precision bearings, pre-lubricated and efficiently sealed. Also available with stamped flanges, these bearings become complete, initially aligned units for quick assembly.

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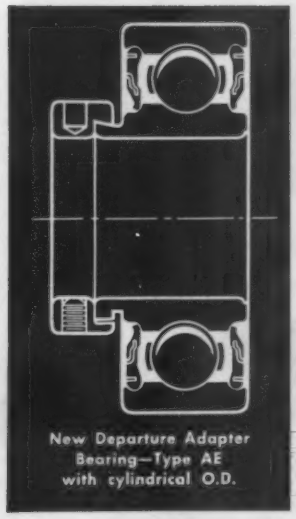
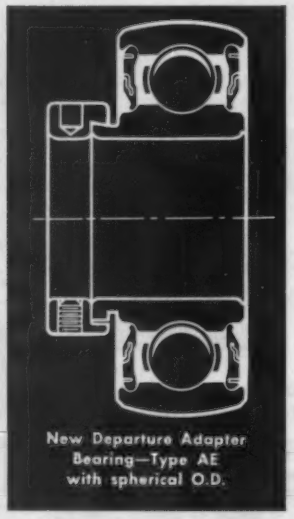

New Departure Adapter Bearing—Type AE with cylindrical O.D.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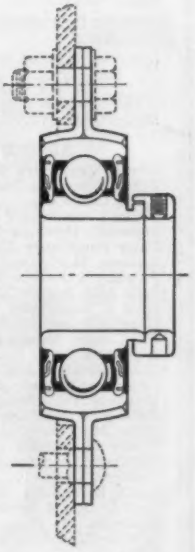

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Bulletin 855
Bulletin 854

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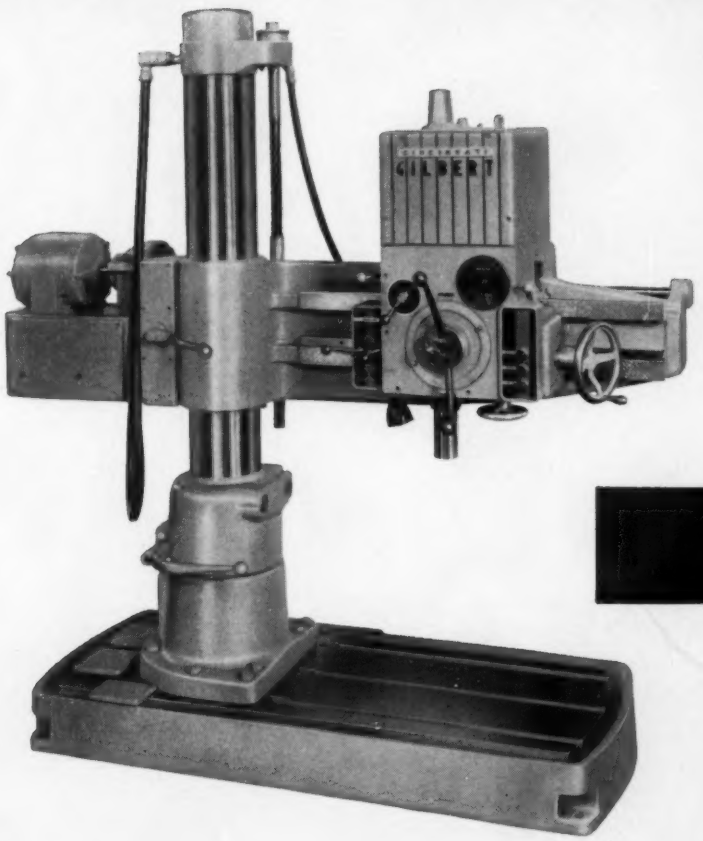

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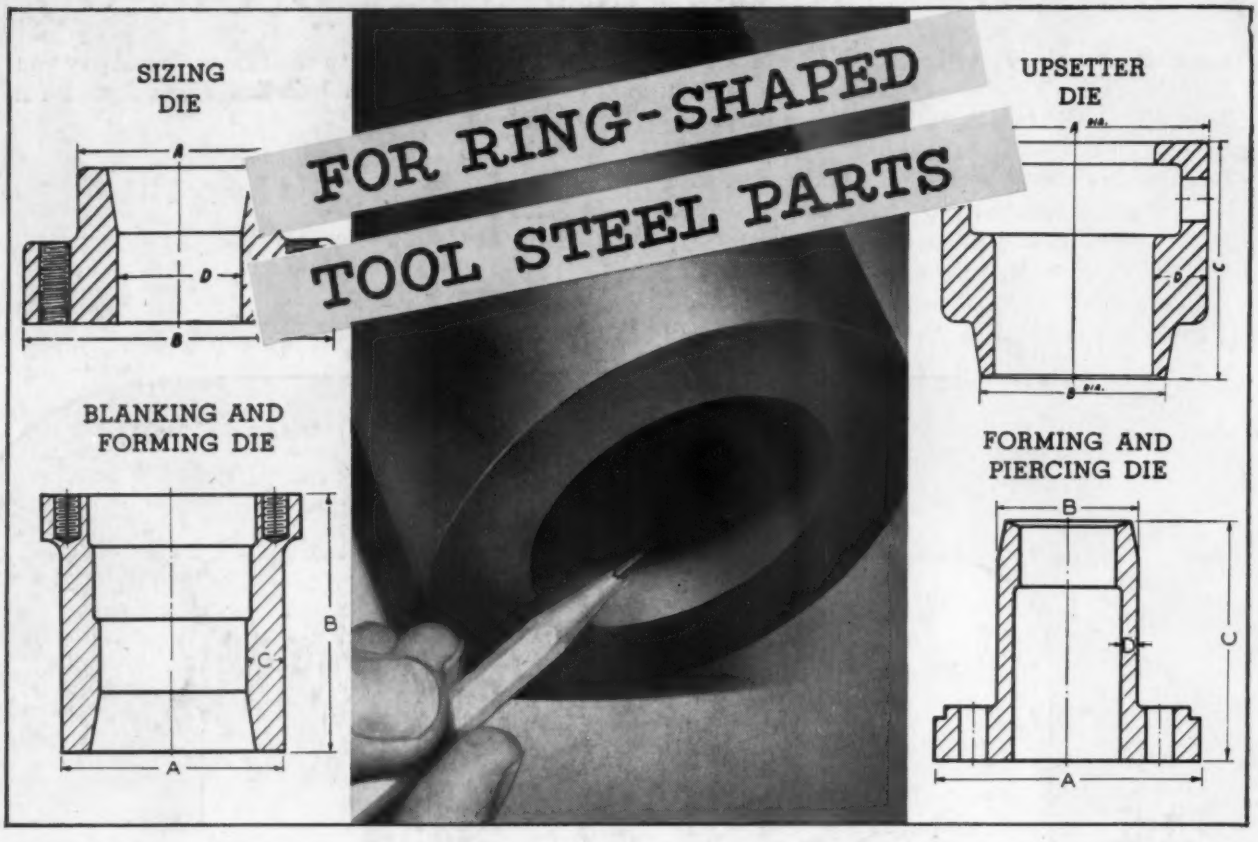

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